Pan-Canadian Health Inequalities Reporting Initiative

Key Health Inequalities in Canada

A National Portrait

Public Health Agency of Canada
Agence de la santé publique du Canada

Pan-Canadian Public Health Network
Partners in Public Health

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PREFACE

Message from the Co-Chairs of the Pan-Canadian Public Health Network

In 2010, Canada's Federal, Provincial and Territorial Ministers of Health and of Health Promotion/Healthy Living adopted the Declaration on Prevention and Promotion. The Declaration recognizes the importance of the social, economic and environmental conditions, collectively known as the social determinants of health. Canada has also joined the global call to action to reduce health inequities by signing the 2011 Rio Political Declaration on the Social Determinants of Health, joining other WHO Member States in a pledge to strengthen capacity, evidence and action on the social determinants of health and health equity. More recently, in 2015, the UN General Assembly adopted the 2030 Agenda for Sustainable Development. The Agenda's 17 goals reflect a wide range of social determinants of health, and include specific objectives to reduce inequalities.

Reducing health inequalities in Canada is a complex undertaking and remains an important challenge for our public health agenda. A key step in addressing this challenge is strengthening the measurement, monitoring and reporting capacity of health inequalities. The Pan-Canadian Health Inequalities Reporting Initiative – a collaborative undertaking by the Public Health Agency of Canada, the Pan-Canadian Public Health Network, Statistics Canada, the Canadian Institute for Health Information and the First Nations Information Governance Centre – responds to this need. This report is the first pan-Canadian effort to document Canada's health inequalities and describe differences in the health outcomes, daily living conditions and structural conditions that support health among various populations. It provides a baseline of health inequalities data to inform policy, program and future action to advance health equity.

The report is complemented by an online interactive database, the Health Inequalities Data Tool, which includes both absolute and relative measures of inequalities and their impact at the population level for health outcomes, health-related behaviours and social determinants of health.

Tackling health inequities requires evidence, ingenuity, shared goals and ongoing collaboration across various sectors and levels of government. This report is an important step towards our collective goal of reducing health inequities in Canada.

Dr. Theresa Tam
Chief Public Health Officer of Canada
Public Health Agency of Canada

Dr. Robert Strang
Chief Medical Officer of Health
Department of Health and Wellness, Nova Scotia

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The PHN, a coordinating body of federal, provincial and territorial public health departments, provided guidance and input on the HIR Initiative through its Healthy People and Communities Steering Committee. PHAC led the analysis, report writing, consultations and expert reviews, and provided overall project management. Statistics Canada provided methodological expertise and data analysis across multiple data sources. The Canadian Population Health Initiative of CIHI – an independent, not-for-profit organization for health information – contributed to the content and methods as well as analysis of data from CIHI's Hospital Mental Health Database. Finally, FNIGC provided data and analysis pertaining to the health of First Nations people living on reserve and in northern communities. All partners reviewed and provided feedback on various sections of the full report.

At PHAC, the Key Health Inequalities in Canada: A National Portrait report was led by a core team within the Social Determinants of Health Division: Malgorzata Miszkurka, Beth Jackson, Albert Kwan, Colin Steensma and Marie DesMeules.

The report was prepared by the following individuals at PHAC (past and present): Rojiemiahd Edjoc; Jia Hu; Linda Jacobsen; Nasim Khatibsemnani; Audrey Layes; Novella Martinello; Debjani Mitra; Howard Morrison; Heather Orpana; Natalie Osorio; Sai Yi Pan; Matthew Perks; Kiri Shafto; Ashley Shaw; and Feng Wang.

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Statistics Canada
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Canadian Institute for Health Information
Better data. Better decisions. Healthier Canadians.

FNIGC | CGIPN
First Nations Information Governance Centre
Le Centre de gouvernance de l'information des Premières Nations

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Please note that the analyses and conclusions in this report do not necessarily reflect those of the Technical Working Group members or of the reviewers or their affiliated organizations. For further clarity, the views expressed herein are solely those of the authors and do not necessarily reflect those of the Agency for Healthcare Research and Quality, the United States Department of Health and Human Services, or the United States Federal government.

The report was copy-edited by Joanna Odrowaz, whom we wish to thank for her thorough and thoughtful editorial suggestions.

EXECUTIVE SUMMARY

ACRONYM	FULL NAME
CIHI	Canadian Institute for Health Information
FNIGC	First Nations Information Governance Centre
HIR	Health Inequalities Reporting
PHAC	Public Health Agency of Canada
PHN	Pan-Canadian Public Health Network
RHS	First Nations Regional Health Survey
SHS	Second-Hand Smoke
SRMH	Self-Rated Mental Health
WHO	World Health Organization

Health inequalities in Canada exist, are persistent, and in some cases, are growing (1-3). Many of these inequalities are the result of individuals' and groups' relative social, political, and economic disadvantages. Such inequalities affect peoples' chances of achieving and maintaining good health over their lifetimes (4). Where inequalities in health outcomes or in access to the resources that support health are systematic (that is, the patterns of difference are consistently observable between population groups) and can plausibly be avoided or ameliorated by collective action, they may be deemed unjust and *inequitable* (5-7).

This report describes the magnitude and distribution of key health inequalities in Canada, a critical step in facilitating action to advance health equity. It is a product of the Pan-Canadian Health Inequalities Reporting (HIR) Initiative, a collaborative undertaking by the Public Health Agency of Canada (PHAC), the Pan-Canadian Public Health Network (PHN), Statistics Canada, and the Canadian Institute for Health Information (CIHI).

The HIR Initiative aims to strengthen health inequalities measurement, monitoring, and reporting capacity in Canada. It is intended to support surveillance and research activities, inform policy and program decision making to more effectively reduce health inequalities, and enable the monitoring of progress in this area over time.

The HIR Initiative's theoretical foundations are based on a conceptual framework originally developed by the World Health Organization (WHO) Commission on Social Determinants of Health (8). This framework highlights the critical roles that broad social, economic, and political factors (e.g. systems of governance; macroeconomic, social, and public policies; and societal values and norms) play in generating and reinforcing societal hierarchies. These differences in socioeconomic positions shape the health-influencing social and physical conditions in which individuals are born, grow, live, work, and age. These conditions include material circumstances (e.g. living and housing standards, workplace conditions, neighbourhood amenities and safety); psychosocial factors (e.g. job strain, social connectedness or isolation, access to social support); health behaviours (e.g. diet, physical activity, tobacco and alcohol consumption); and biological (including genetic) factors. The interactions between these various domains are the means by which inequitable social processes are translated into inequities in health and well-being outcomes.

Building on a set of indicators proposed by PHN in 2010, the HIR Initiative brought together data on more than 70 indicators of health outcomes, risk factors, and social determinants of health. These indicators were systematically disaggregated across a range of socioeconomic and sociodemographic variables ("social stratifier groups") meaningful to health equity (see Figure 1).

FIGURE 1

Summary of the analytical approach for the HIR Initiative

INDICATORS

HEALTH STATUS

Including indicators for:

- Life expectancy and health-adjusted life expectancy
- Mortality and disability
- Perceived physical and mental health
- Infectious and chronic diseases

HEALTH DETERMINANTS

Including indicators for:

- Health behaviours
- Early childhood development
- Physical and social environments
- Working conditions
- Access to health care
- Social protection
- Social inequities

SOCIAL STRATIFIERS

SOCIOECONOMIC STATUS

- Income
- Education
- Employment
- Occupation
- Material and social deprivation

INDIGENOUS PEOPLES

- First Nations
- Inuit
- Métis

PLACE OF RESIDENCE

- Rural/Urban

POPULATION GROUP

- Age
- Immigrant status
- Sexual orientation
- Functional health
- Cultural/racial background

SEX: Male or Female

JURISDICTION: National or Provincial/Territorial

The resulting portrait of the state of health inequalities in Canada is available through the Health Inequalities Data Tool, an online interactive database (http://infobase.phac-aspc.gc.ca/health-inequalities).

Drawing from the full set of health outcome and health determinant indicators in the Data Tool, the present report highlights results for 22 indicators that represent some of the most pronounced and widespread health inequalities in Canada, as potential priority areas for initial action (see Figure 2).

FIGURE 2

Indicator list for the Key Health Inequalities in Canada report

INDICATOR DOMAIN	INDICATOR
Health Outcomes	• Life expectancy at birth • Health-adjusted life expectancy • Infant mortality • Unintentional injury mortality • Suicide mortality • Perceived mental health (fair or poor) • Mental illness hospitalization rate • Arthritis • Asthma • Diabetes (excluding gestational) • Disability • Lung cancer incidence • Obesity • Oral health (inability to chew) • Tuberculosis
Health Determinants A: Daily Living Conditions	• Alcohol use – heavy drinking • Smoking • Core housing need • Exposure to second-hand smoke in the home
Health Determinants B: Structural Drivers	• Early childhood development (Early Development Instrument) • Food insecurity • Working poor

Health determinant indicators can be daily living conditions such as high alcohol consumption; smoking, and exposure to second-hand smoke; early childhood development; and core housing need. Similarly, structural drivers, for example, household food insecurity and working poverty, can be health determinant indicators.

- The indicators featured in this report were selected based on several considerations, including whether they:
- reveal inequalities that are particularly pronounced and widespread across population groups;
- cover a range of health outcomes, health behaviours and broader social determinants of health;
- allow for systematic disaggregation of data across **key population groups**; and
- are policy-relevant and actionable.

BOX 1
SOCIAL DETERMINANTS OF HEALTH AND HEALTH INEQUALITIES–INDIGENOUS PERSPECTIVES

Prepared by the First Nations Information Governance Centre and Métis National Council

Traditionally, Indigenous peoples have viewed health in a balanced and holistic way, with connections between spiritual, emotional, mental and physical dimensions. Similarly, the determinants of Indigenous health are seen as closely interconnected (9-11). They include *proximal determinants* (e.g. health behaviours), *intermediate* determinants (e.g. community infrastructure, kinship networks, relationship to the land, language, ceremonies, and knowledge sharing), and *structural* determinants (e.g. historical, political, ideological, economic, and social foundations, including elements of strength such as Indigenous world views, spirituality, and self-determination) (11,12). From the Métis perspective, it is important to integrate Indigenous and Western knowledge development approaches in order to draw holistically from the narratives, experiences, information and data available from both of these ancestral 'ways of knowing' (10).

In order to understand health inequalities between Indigenous and non-Indigenous peoples, it is necessary to contextualize them within the historical, political, social, and economic conditions that have influenced Indigenous health. The colonial structure, which sought to assimilate Indigenous peoples into the dominant Euro-Canadian culture, has been largely responsible for destabilizing the determinants of Indigenous health (13). The forced displacement of First Nations into remote communities and reserves that were uninhabitable and lacking in resources; the claiming of traditional areas rich in resources by colonial powers; the oppression of First Nations created by the *Indian Act*; the damaging legacy of Indian Residential Schools and the Sixties Scoop; systemic discrimination against all Indigenous peoples across social, criminal justice, health care, and employment environments; and the lack of public or private economic development investments for Indigenous communities are all examples of how the colonial structure have contributed to the health inequities that exist today (11,14). In addition to this lived experience of colonialism, racism and inability to pursue self-determination, health inequalities in Métis peoples have also been particularly influenced by social exclusion and loss of Indigenous language due to cultural assimilation (10,12).

The indicators selected for this report are useful for highlighting health inequalities that exist between Indigenous and non-Indigenous peoples and for gauging progress towards the elimination of such inequalities. However, on their own, these quantitative and largely deficit-based indicators do not adequately incorporate Indigenous concepts of health and wellness; are insufficient for creating programs and policies that contribute to improving the health of the Indigenous population; and may even be harmful if used incorrectly, as they risk continuing to label Indigenous peoples with negative stereotypes (15,16). Moreover, without adequate explanatory context about the structural factors that have impacted Indigenous communities (e.g. inadequate infrastructure funding, discriminatory policies that limited access to loans or mortgages), indicators that focus solely on the problems in these communities can reinforce discriminatory attitudes towards Indigenous peoples. Ultimately, for health planning and action to be effective, indicators must be Indigenous-specific and community-driven, taking into consideration Indigenous peoples' holistic worldviews, histories, and resources (16). A balanced approach that identifies protective factors such as resilience, self-determination, and identity provides a more complete understanding of the issue and can be more effective in empowering and mobilizing individuals or a community towards improving health.

This report draws on a number of national surveys and administrative databases to populate the indicators, including the Canadian Community Health Survey, Canadian Vital Statistics Database, and the Canadian Cancer Registry. While many of these sources capture data for First Nations people living off reserve, the Métis and the Inuit, most exclude First Nations people living on reserve and in northern communities. Helping to fill this information gap is the First Nations Regional Health Survey (RHS), the only First Nations–governed national health survey in Canada. The RHS, coordinated by the First Nations Information Governance Centre (FNIGC) in collaboration with its 10 Regional Partners, collects information about First Nations people living on reserve and in northern communities based on both Western and traditional understandings of health and well-being. In the present report, where applicable, national-level RHS data and contextual information for First Nations people living on reserve and in northern communities are provided by FNIGC. PHAC has worked in partnership with FNIGC to ensure that the inclusion of on-reserve First Nations data in this report is in compliance with the First Nations principles of OCAP® (Ownership, Control, Access and Possession).

FINDINGS

Overall, significant health inequalities were observed among Indigenous peoples, sexual and racial minorities, immigrants, and people living with functional limitations, and a gradient of inequalities by socioeconomic status (income, education levels, employment, and occupation status) could be seen for many indicators. Some populations (in particular, those with lower socioeconomic status as well as First Nations, Inuit and Métis peoples) had consistently less favourable results, while other groups (e.g. recent immigrants and racial minorities) experienced mixed outcomes in terms of health behaviours, health outcomes, and structural determinants of health.

Health Outcomes

Life expectancy and mortality. Clear socioeconomic gradients were observed across life expectancy and mortality indicators. **Life expectancy** and **health-adjusted life expectancy** were consistently lower and **infant mortality** and **unintentional injury mortality** were consistently higher among those living in lower-income areas, with lower educational attainment, and with greater material and social deprivation. These health outcomes were also worse in areas with a high concentration of First Nations, Inuit, and Métis people. Similar socioeconomic gradients by income, education, and material and social deprivation could be seen for **suicide mortality**. Suicide mortality was also relatively high in areas with a high concentration of First Nations, Inuit, and Métis people, and particularly high among men living in areas with a high concentration of people identifying as Inuit. Across all social stratifier groups, suicide mortality was higher among men than women.

Mental health and mental illness. Low **self-rated mental health** (SRMH) was more common among those with the lowest income, lower levels of educational attainment, and unskilled and semi-skilled occupations, and decreased as socioeconomic gradients increased. Low SRMH was also more common among those identifying as bisexual or gay/lesbian compared with those identifying as heterosexual.

Clear socioeconomic gradients were likewise observed for **mental illness hospitalizations**, which increased with each step-wise decrease in neighbourhood income and educational attainment levels, and with each step-wise increase in material and social deprivation. Also, in areas with a high concentration of people identifying as Métis, Inuit, or First Nations, mental illness hospitalization rates were two to three times the rate among people who live in areas with a low concentration of people identifying as Indigenous.

Cause-specific outcomes. Compared with employed adults, those who were permanently unable to work reported significantly higher prevalence of **arthritis**,

asthma, and **diabetes**. Similarly, people with lower income and lower educational attainment levels consistently reported higher prevalence of these chronic diseases than those in higher socioeconomic status groups. **Arthritis, asthma**, and **obesity** were less prevalent among immigrant Canadians, especially recent immigrants (in Canada for 10 years or less), than among non-immigrant Canadians. However, **diabetes** prevalence was higher among long-term immigrants than non-immigrants.

Indigenous peoples also face inequalities in cause-specific outcomes. The prevalence of **arthritis, asthma, diabetes,** and **obesity** were higher among First Nations adults living off reserve, First Nations adults living on reserve and in northern communities, and Métis adults than among non-Indigenous adults. Among Inuit adults, obesity was also higher than among non-Indigenous Canadians; results for other cause-specific outcomes were not statistically significant.

Inequalities in **disability** and poor **oral health** (inability to chew) were particularly pronounced between socioeconomic groups (by employment status, educational attainment, and income level).

Finally, based on case report data, the incidence of active **tuberculosis** was exceptionally high among the Inuit, at nearly 300 times the rate among Canadian-born non-Indigenous people. Active tuberculosis incidence rates were also very high among First Nations people living on reserve and foreign-born Canadians, at 32 times and 20 times, respectively, the rate among Canadian-born non-Indigenous people.

Health Determinants: Daily Living Conditions

Health behaviours. A strong socioeconomic gradient was evident for **smoking, exposure to second-hand smoke (SHS) in the home,** and **lung cancer incidence**: all three indicators increased as levels of income, educational attainment, and occupational skill (for smoking and SHS) decreased, and as neighbourhood social and material deprivation (for lung cancer incidence) increased. The prevalence of **smoking** among adults with less than a high school education was nearly 4 times that of university graduates, and prevalence among unskilled workers more than twice that of professional workers. Similarly, **exposure to SHS** was significantly higher among those in the lower educational attainment, occupational status, and income groups.

In contrast, **high alcohol consumption** was more prevalent among people with higher income. In terms of educational attainment, heavy drinking prevalence was lowest among university graduates and similar across other education groups. High alcohol consumption was about 3 times higher among White adults than among Black, East/Southeast Asian, South Asian, and Arab/West Asian Canadians. The prevalence of high alcohol consumption and smoking were also higher among Inuit, Métis, and First Nations people living both off reserve and on reserve than among non-Indigenous peoples.

Physical and social environments. The prevalence of **core housing need** among Canadians in the lowest income group was nearly 7.5 times as high as among Canadians in the highest income group, decreasing along a step-wise gradient, from lowest to highest income. Recent immigrants reported a prevalence of core housing need twice that of non-immigrants; the magnitude of inequality in core housing need was even higher between recent immigrants who are visible minorities compared with non-immigrants who were not visible minorities.

Health Determinants: Structural Drivers

Early childhood development. The proportion of **developmental vulnerability in early childhood** among children living in the most materially and socially deprived neighbourhoods was more than twice as high as among children living in the least deprived neighbourhoods. Similarly, this proportion was twice as high among children who were identified by their teacher as Indigenous than among those who were identified as non-Indigenous. A clear socioeconomic gradient is evident here as well, where observed prevalence of developmental vulnerability increases as neighbourhood income and education levels decrease.

Social inequities. Low socioeconomic status was strongly related to structural drivers of inequity. For example, **household food insecurity** due to financial constraints increased dramatically as household income decreased, with the prevalence among adults in the lowest income group nearly 30 times that of adults in the highest income group. Among adults in households where none of its members had completed high school, the prevalence of food insecurity was 8.5 times that of adults in households with at least one university graduate. Food insecurity was 3.7, 2.7, and 2.2 times as prevalent among Inuit, First Nations living off reserve, and Métis adults, respectively, as among non-Indigenous adults. (The prevalence of household food insecurity was also high among First Nations people living on reserve and in northern communities, although results cannot be directly compared with the prevalence among non-Indigenous Canadians due to methodological limitations.) The prevalence of household food insecurity was also nearly 3 times higher among adults who identified as bisexual than those who identified as heterosexual. The prevalence of **working poverty** was notably higher among Canadians who had not completed high school, First Nations people living off reserve, recent immigrants, and racial minorities.

DISCUSSION AND IMPLICATIONS

Canadians are among the healthiest people in the world. However, as this report shows, the benefits of good health are not equally enjoyed by all Canadians. Some of these observed inequalities are consistent with what is known from other research on the social determinants of health and health equity, while others remain to be more fully explored. Regardless, the persistence, breadth, and depth of health inequalities in Canada constitute a call to action across all levels and sectors of society. In recent decades, the global evidence on what works to reduce health inequities has grown, making it possible to identify key principles for action and promising practices that can be adapted to advance health equity within the Canadian context.

1. **Adopt a human rights approach to action on the social determinants of health and health equity.** A human rights approach recognizes that equitable access to opportunities for health, well-being, and their determinants is an issue of fairness and justice. The right to health in particular is recognized in a number of United Nations covenants and conventions to which Canada is a party, including the International Covenant on Economic, Social and Cultural Rights. Implementation of a human rights approach to health can be supported by evidence-based, participatory, and coherent action across governments and sectors, including working with communities most affected by health inequalities to design interventions that are both relevant and effective.

2. **Intervene across the life course with evidence-informed policies and culturally safe health and social services.** Advantages and disadvantages in health and the distribution of its social determinants accumulate over an individual's life course and over generations. Interventions at different life stages, particularly during critical or sensitive periods (e.g. early years) can substantially affect health outcomes and health equity.

3. **Intervene on both proximal (downstream) and distal (upstream) determinants of health and health equity.** Public health actions that focus on individual-level behavioural determinants may inadvertently increase health inequalities in the absence of accompanying efforts that target "upstream" socioeconomic, political, cultural, and environmental factors.

4. **Deploy a combination of targeted interventions and universal policies/interventions.** Policy and program interventions may be specifically targeted towards those with the poorest health

outcomes and greatest social disadvantage or they may be designed for universal delivery across the whole population but implemented at different levels of intensities depending on the varying needs of specific sub-groups ("proportionate universalism"). Pairing targeted and universal interventions helps ensure that the targeted intervention effects are not "washed out" by broader conditions that may sustain social inequalities.

5. **Address both material contexts (living, working, and environmental conditions) and sociocultural processes of power, privilege, and exclusion (how social inequalities are maintained across the life course and across generations).** Both material deprivation and sociocultural processes that maintain privilege and disadvantage and inclusion and exclusion play important roles in generating and reinforcing social and health inequities. In addition to addressing material conditions, effective action on health equity must also include efforts to empower disadvantaged communities and tackle the harmful processes of marginalization and exclusion (e.g. systemic discrimination and stigmatization) embedded in hierarchies of power and privilege.

6. **Implement a "Health in All Policies" approach.** Recognizing that many of the policy levers that influence the social determinants of health lie outside of the health sector and, as such, can only be addressed through collaborative engagement with others, WHO has developed a "Health in All Policies" framework to support government sectors in systematically taking into account the health implications of their policy decisions in order to better avoid harmful health impacts and improve population health and health equity.

7. **Carry out ongoing monitoring and evaluation.** Improving population health and health equity requires current, systematic, and robust evidence to inform policy actors, practitioners, community organizations, and citizens about how health and its determinants are distributed across subpopulations, and how policies and interventions affect health and health equity. Ongoing monitoring and reporting on the magnitude and trends of health inequalities and their determinants supports public actors in evaluating their progress.

Ultimately, achieving the goal of health equity demands that we acknowledge our interdependence—our shared responsibility to create and sustain healthful living and working conditions and environments, and the shared benefits that we can all enjoy when those conditions are in place. Tackling health inequities requires effort, innovation and ingenuity, but Canadians are up to the task if we apply our collective will and wits in service of our common good.

References

(1) Health Disparities Task Group of the Federal/Provincial/Territorial Advisory Committee on Population Health and Health Security. Reducing health disparities: Roles of the health sector. 2005 .

(2) Butler-Jones D. The Chief Public Health Officer's report on the state of public health in Canada: 2008. Ottawa, ON: Public Health Agency of Canada; 2008.

(3) Canadian Institute for Health Information. Trends in income-related health inequalities in Canada: technical report: revised July 2016 [Internet]. Ottawa: Canadian Institute for Health Information; 2016 [cited 2017 Feb 15]. Available from: https://secure.cihi.ca/free_products/trends_in_income_related_inequalities_in_canada_2015_en.pdf.

(4) Marmot M, Allen JJ. Social determinants of health equity. AJPH. 2014;104(S4):S517-9.

(5) Whitehead M. The concepts and principles of equity and health. Health Promot Internation. 1991;6(3):217-28.

(6) Braveman PA, Kumanyika S, Fielding J, LaVeist T, Borrell LN, Manderscheid R, et al. Health disparities and health equity: the issue is justice. Am J Public Health. 2011;101(S1):S149-55.

(7) Braveman P. What are health disparities and health equity? We need to be clear. Public Health Rep. 2014;129(1_suppl2):5-8.

(8) Solar O and Irwin A. Social Determinants of Health Discussion Paper 2 (Policy and Practice). 2010.

(9) Inuit Tapiriit Kanatami . Social determinants of Inuit Health in Canada [Internet]. Ottawa: Inuit Tapiriit Kanatami; 2014 [cited 2017 Sep 29]. Available from: https://itk.ca/wp-content/uploads/2016/07/ITK_Social_Determinants_Report.pdf.

(10) Martens P, Bartlett J, Burland E, et al. Profile of Metis Health Status and Healthcare Utilization in Manitoba: A Population-Based Study [Internet]. Winnipeg: Manitoba Centre for Health Policy; 2010 [cited 2017 Sep 29]. Available from: http://mchp-appserv.cpe.umanitoba.ca/reference/MCHP-Metis_Health_Status_Full_Report_(WEB)_(update_aug11_2011).pdf.

(11) Reading C. Structural determinants of aboriginal peoples' health. In: Greenwood M, De Leeuw S, Lindsay N, Reading C, editors. Determinants of aboriginal peoples' health; 2015. p. 1-15.

(12) Reading C and Wien F. Health inequalities and social determinants of Aboriginal people's health [Internet]. Prince George: National Collaborating Centre for Aboriginal Health; 2009 [cited 2017 Sep 09]. Available from: http://www.nccah-ccnsa.ca/docs/social%20determinates/nccah-loppie-wien_report.pdf.

(13) Waldram JB, Herring A, Young TK. Aboriginal health in Canada: Historical, cultural, and epidemiological perspectives. : University of Toronto Press; 2006.

(14) Dussault R, Erasmus G. Report of the royal commission on aboriginal peoples. 1996.

(15) Anderson RB, Dana LP, Dana TE. Indigenous land rights, entrepreneurship, and economic development in Canada:"Opting-in" to the global economy. Journal of World Business. 2006;41(1):45-55.

(16) Donatuto J, Campbell L, Gregory R. Developing responsive indicators of indigenous community health. International journal of environmental research and public health. 2016;13(9):899.

KEY HEALTH INEQUALITIES IN CANADA: INTRODUCTION

ACRONYM	FULL NAME
CIHI	Canadian Institute for Health Information
CSDH	Commission on Social Determinants of Health
F/P/T	Federal/Provincial/Territorial
FNIGC	First Nations Information Governance Centre
HIR	Health Inequalities Reporting
PHAC	Public Health Agency of Canada
PHN	Pan-Canadian Public Health Network
PHPEG	The Population Health Promotion Expert Group
RHS	First Nations Regional Health Survey
WHO	World Health Organization

Canadians as a whole enjoy good health, but the benefits of good health are not equally enjoyed by all. Health inequalities in Canada persist and, in some cases, are growing (1-3).

Some of these differences in health can be explained by biological, physiological, and genetic dissimilarities between people (e.g. older people tend to have worse health outcomes than younger people as a function of the aging process). Many health inequalities, however, have more to do with individuals' and groups' social, political, and economic advantages or disadvantages and how these affect their chances of achieving and maintaining good health over their lifetimes (4). People who have more access to social and material resources tend to have better health outcomes than people from socially disadvantaged[1] groups—those with lower income or education and less stable employment opportunities or who experience institutional or interpersonal discrimination or geographical isolation (5,6). This tendency to have better health outcomes occurs even when people with greater privilege are exposed to harmful conditions or environments. Inequalities in health outcomes or in access to the resources that support health are *systematic* if the patterns of difference between population groups are consistently observed over time. If these differences can be avoided or ameliorated by collective action (especially in areas where individuals have little direct control, such as school quality or exposure to environmental pollutants), they may be deemed unjust and *inequitable* (7-9) (see Box 1).

Health inequities are a public health and societal concern because they "are inconsistent with Canadian values, threaten the cohesiveness of community and society, challenge the sustainability of the health system, and have an impact on the economy" (1). Correspondingly, the goal of health equity is consistent with fundamental values expressed in domestic and international human rights codes and in ethical positions that consider health a critical resource for the full enjoyment of and participation in society (8,10,11). In other words, equitable access to opportunities for health and well-being, and their determinants (defined below), is an issue of fairness and justice.

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1. Social disadvantage refers to "the unfavorable social, economic, or political conditions that some groups of people systematically experience based on their relative position in social hierarchies. It means restricted ability to participate fully in society and enjoy the benefits of progress. Social disadvantage is reflected, for example, by low levels of wealth, income, education, or occupational rank, or by less representation at high levels of political office."(8)

BOX 1
KEY DEFINITIONS

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Health inequities refer to the subset of health inequalities that are deemed to be unfair or unjust, that arise from the systematic and intentional or unintentional marginalization of certain groups, and that are likely to reinforce or exacerbate disadvantage and vulnerability.

Health equity refers to the absence of unfair and avoidable or remediable differences in health among population groups defined socially, economically, demographically or geographically.

This report identifies and describes the magnitude and distribution of key health inequalities in Canada. It is a critical step in facilitating action to advance health equity. This effort of the Pan-Canadian Health Inequalities Reporting (HIR) Initiative, a collaborative undertaking by the Public Health Agency of Canada (PHAC), the Pan-Canadian Public Health Network (PHN), Statistics Canada, and the Canadian Institute for Health Information (CIHI), aims to strengthen health inequalities measurement, monitoring, and reporting capacity in Canada. The findings of this report can inform, support, and strengthen the development of research, programs, policies, and plans to address health inequities in Canada.

This chapter

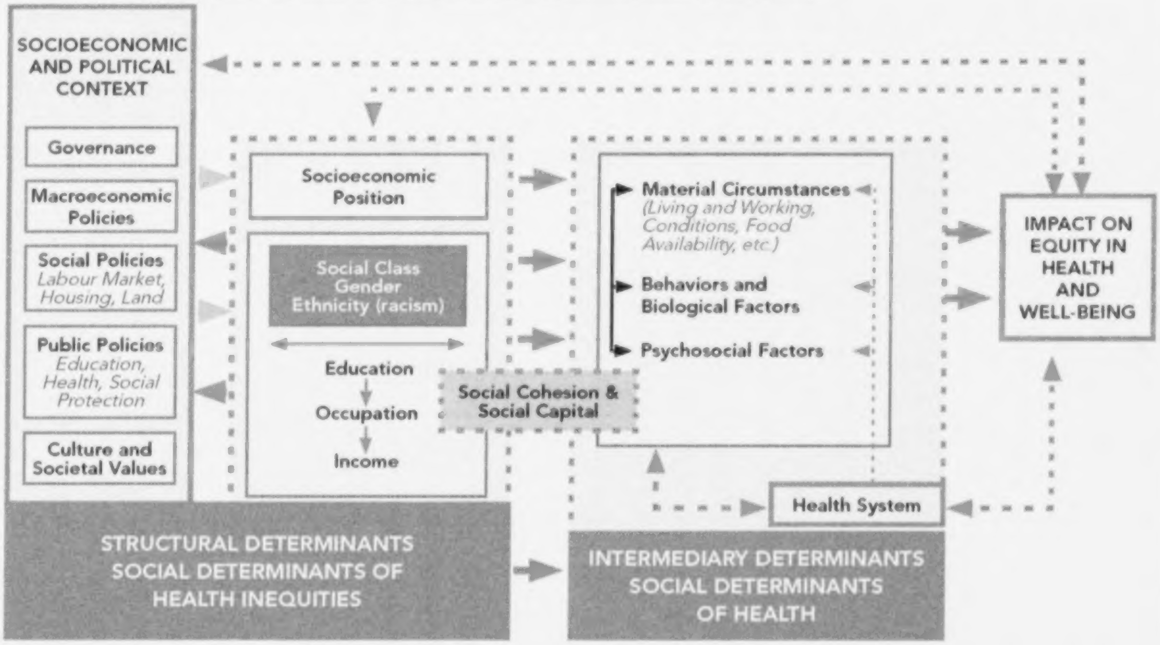
- outlines the theoretical and conceptual foundations underpinning the HIR Initiative overall and this report in particular;
- provides a brief overview of the background to the HIR Initiative; and
- describes this report's structure and contents.

Monitoring and Reporting on Health Inequalities: Conceptual Foundations

The Commission on Social Determinants of Health (CSDH) was established by the World Health Organization (WHO) to gather evidence on the social determinants of health, their impact, and what can be done to achieve global health equity. The Commission's work and its final report, *Closing the gap in a generation: Health equity through action on the social determinants of health* (12), was guided by a conceptual framework that describes the root causes of health inequities and how these root causes can lead to unequal outcomes in population health (13). This conceptual framework (see Figure 1) also guides this report.

FIGURE 1

Conceptual Framework for Action on the Social Determinants of Health (Solar & Irwin 2010)


SOCIOECONOMIC AND POLITICAL CONTEXT
Governance
Macroeconomic Policies
Social Policies
Labour Market, Housing, Land
Public Policies
Education, Health, Social Protection
Culture and Societal Values
Socioeconomic Position
Social Class
Gender
Ethnicity (racism)
Education
Occupation
Income
Social Cohesion & Social Capital
Material Circumstances
(Living and Working, Conditions, Food Availability, etc.)
Behaviors and Biological Factors
Psychosocial Factors
Health System
IMPACT ON EQUITY IN HEALTH AND WELL-BEING
STRUCTURAL DETERMINANTS
SOCIAL DETERMINANTS OF HEALTH INEQUITIES
INTERMEDIARY DETERMINANTS
SOCIAL DETERMINANTS OF HEALTH

Source: Reproduced with the permission of the publisher. From: Solar O, Irwin A. A Conceptual Framework for Action on the Social Determinants of Health. Discussion Paper Series on Social Determinants of Health, no. 2. Geneva, Switzerland: WHO; 2010. http://www.who.int/social_determinants/publications/9789241500852/en/

The CSDH conceptual framework identifies three key components that together shape equity in health and well-being:

- Socioeconomic and political context;
- Structural determinants and socioeconomic position; and
- Intermediary determinants of health.

The foundational level in the model is the socioeconomic and political context. These are the fundamental structures, processes, rules, and assumptions by which a society organizes itself; generates and reinforces its social hierarchies; and shapes how individuals and groups relate to one another. Social structures, such as financial markets, health care systems, education systems, and labour markets, are made visible by concrete objects in our everyday lives (e.g. banks, hospitals, schools, workplaces). But such social structures are much more than their physical edifices; they are built upon systems of ideas and beliefs (i.e. about economies, gender, "race," etc.) and are constituted by enduring and interrelated social relationships (such as those between lender and debtor, doctor and patient, teacher and student, employer and employee). These relationships are defined by complementary (or antagonistic) roles, responsibilities, rights, and rewards.

While social structures tend to be durable, they are not static; as sets of social relations, they are continuously reproduced by the people within them. It is through this repetition that social structures take on an aspect of permanence and shape individuals and their cultural and physical environments over time.

A person's position within each of these social structures gives them different access to power, prestige, opportunities, constraints, and material resources. To complicate matters, individuals occupy different positions in many social structures concurrently. A person's position in these interlocking (and often mutually reinforcing) structures can place him or her at a relative advantage or disadvantage, depending on the circumstances.

The elements of the socioeconomic and political context that are most relevant to health and social inequities include (but are not limited to):

- systems of *governance*, including dominant political and economic ideologies, legal and public administration institutions and practices, civil society participation, and private sector arrangements;
- *macroeconomic policies*, including fiscal and trade policies, and labour markets;
- *social and public policies* in housing, education, employment, health, and other sectors; and
- *societal values*, attitudes and norms related to individualism/collectivism, competition/cooperation, diversity and tolerance of minority groups, fairness and equality, the environment, work, family, and health.

Some of these elements of the socioeconomic and political context may be relevant across jurisdictions (e.g. a country's welfare state and the nature of its redistributive policies), whereas others may be country-specific (e.g. Canada's historical relationship with and treatment of Indigenous peoples; see Box 2).

The socioeconomic and political context and its constituent social structures and institutions provide the setting for, and give rise to, the systematically unequal distribution of power, prestige, and material and social resources in groups in society. As described above, this is achieved through a web of durable, overlapping, and intersecting practices, "a net of restricting and reinforcing relationships" (21). Together, these practices produce a set of unequal *socioeconomic positions* (see Figure 1), whereby individuals are stratified according to income, education, occupation, gender, race, ethnicity, and other factors.

The *socioeconomic and political context*, the related structural mechanisms/practices that generate social stratification, and the resulting *socioeconomic positions* of individuals are characterized within the conceptual framework as *structural determinants*. Together these constitute the *social determinants of health inequities*.

In turn, these socioeconomic positions shape *intermediary determinants* (also referred to as the *social determinants of health*), a complex set of interrelated *social and physical conditions* in which people are born, grow, live, work, and age. These conditions can promote or undermine health. Intermediary determinants are a reflection of a person's place within the social hierarchies. In other words, socioeconomic position strongly influences:

- risk of exposure and vulnerability to health-compromising conditions in daily life, and
- the types and extent of social and economic resources available for protecting health, mitigating the impacts of illness and injury, and enhancing overall well-being.

BOX 2
SOCIAL DETERMINANTS OF HEALTH AND HEALTH INEQUALITIES–INDIGENOUS PERSPECTIVES

Prepared by the First Nations Information Governance Centre and Métis National Council

While First Nations, Inuit and Métis are distinct peoples with unique histories, languages, cultural practices, and political and spiritual beliefs, they have traditionally held similar views of health as holistic and balanced between spiritual, emotional, mental and physical dimensions. Similarly, the social determinants of health are recognized from Indigenous perspectives as being closely interconnected, and have been described using the metaphor of a tree (14-17):

- The crown of the tree represents the *proximal*, or the most directly influential, determinants (e.g. health behaviours, physical environment, and social supports).
- The trunk represents the *intermediate* determinants (e.g. community infrastructure, resources, systems, and capacities). Within an Indigenous framework, these can include kinship networks, relationship to the land, language, ceremonies, and knowledge sharing, which can affect the proximal determinants of health more than the individual's health itself (14,18).
- The roots represent the *distal* or *structural* determinants, which correspond to historical, political, ideological, economic, and social foundations. These can include elements of strength such as Indigenous world views, spirituality, and self-determination. However, when the root system is unhealthy due to maltreatment and deficiencies, it can negatively affect the determinants above the roots, leading to an imbalance between the physical, spiritual, emotional, and mental dimensions of health.

From the Métis perspective, it is important to integrate Indigenous and Western knowledge development approaches in order to draw holistically from the narratives, experiences, information and data available from both of these ancestral "ways of knowing" (17). One specific approach that has been developed is the Métis Life Promotion Framework©, which uses a deliberative process of individual and group reflection to identify how a particular health issue impacts eight key Wellness Areas© (Nature, Identity, Development, Relationship, Network, Support, Environment, and Governance) at either the individual or community level (17).

In order to understand health inequalities between Indigenous and non-Indigenous peoples, it is necessary to understand the historical, political, societal, and economic determinants that have influenced Indigenous health. For Indigenous people, the colonial structure has been largely responsible for destabilizing the roots of the metaphorical tree (19). With the intent of assimilating Indigenous people into the dominant Euro-Canadian culture, colonization greatly diminished the languages and cultures of Indigenous people. Colonization further reduced Indigenous peoples' self-determination by restricting their ability to influence policies that affect them and their communities. The forced displacement of First Nations into remote communities and reserves that were uninhabitable and lacking in resources; the claiming of traditional areas rich in resources by colonial powers; the oppression of First Nations created by the *Indian Act*; the damaging legacy of Indian Residential Schools and the Sixties Scoop; systemic discrimination against all Indigenous peoples across social, criminal justice, health care, and employment environments; and the lack of public or private investment in economic development for Indigenous communities are all examples of how the colonial structure contributed and contributes to the health inequities that exist today (14,20). In addition to this lived experience of colonialism, racism and inability to pursue self-determination, health inequalities in Métis peoples have also been particularly influenced by social exclusion and loss of Indigenous language due to cultural assimilation (14).

The major categories of intermediary determinants are *material circumstances*, *psychosocial factors*, *health-related behaviours*, and *biological factors*. Material circumstances include living and housing standards, workplace conditions, and a neighbourhood's physical characteristics (e.g. public amenities and infrastructure, cleanliness and safety). Closely related are psychosocial factors, which arise from the interplay between environmental conditions and individual psychological functioning. Key psychosocial factors that relate to health inequities include psychosocial stressors (e.g. job strain, negative life events), social connectedness or isolation, access to social support, and coping resources and styles. "Downstream" behaviours, such as those related to diet, physical activity, and tobacco and alcohol consumption, and biological factors (including genetics) are the most proximal—the most directly influencing—determinants of health (e.g. health behaviours, physical environment, and social supports).[2] Accordingly, individual-level behaviours and biology may be seen as the final step by which distal (upstream)[3] inequitable social processes translate into inequities in health and well-being outcomes.

The CSDH framework also includes two important feedback loops. The first involves the health system, which is conceptualized as an intermediary/social determinant of health, though one that plays a direct role in mediating the effects of other intermediary determinants. The ways in which a health system prevents and treats disease and promotes health and wellness—for example, whether it promotes universal access to essential health services regardless of socioeconomic position, invests proportionally in primary prevention and population health promotion initiatives, or targets health system investments towards populations living in vulnerable circumstances—can contribute towards the distribution of health or disease within society, either by tempering or aggravating the impacts of inequities in exposure and vulnerability to harm as well as the differential consequences of illness.

The second feedback loop involves the impact on equity in health and well-being, the final outcome of the CSDH framework. Regardless of social status, the individual-level effects of illness and injury can reverberate onto a person's socioeconomic position, for example, by affecting their employment status or income. Yet even at this stage, inequitable preconditions promote further inequities, since the specific social and economic consequences of ill health can vary significantly depending on the initial socioeconomic position of the person who falls sick or is injured. People who occupy lower tiers of the social hierarchy—who have fewer resources and opportunities with which to mitigate ill health—tend to experience the effects of ill health on socioeconomic position more severely than do those who occupy higher tiers. This further reinforces existing higher-level inequities across the structural determinants.

Tracking the elements and outcomes of the CSDH Framework for Action on the Social Determinants of Health, as outlined here, requires systematic data collection and analysis. This monitoring is essential for measuring progress towards health equity goals.

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[2] Nevertheless, even though behavioural factors operate as personal choices at the individual level, they are also mediated by socioeconomic position, which circumscribes the range and accessibility of health-related choices and opportunities available at different strata of social hierarchies, as each stratum is exposed to different material circumstances and social conditions.

[3] "Upstream" (or distal) factors refer to how our society is organized, including the distribution of power and resources that shape the conditions in which people are born, develop, live, work, and grow old; these are features of our society, not features of individuals, so individual-level interventions are insufficient to alter them (21).

Monitoring Health Inequalities and Social Determinants of Health

In its final report, the CSDH argued that "action on the social determinants of health will be more effective if basic data systems, including vital registration and routine monitoring of health inequity and the social determinants of health, are in place and there are mechanisms to ensure that the data are understood and applied to develop more effective interventions" (12). The CSDH urged national governments to invest in training on the social determinants of health to enhance capacity among policy actors, health practitioners, and other relevant disciplines (e.g. urban planning) and to "establish a national health equity surveillance system, with routine collection of data on social determinants of health and health inequity" through stratification by social groups relevant to each country's context.

To help jurisdictions achieve this, the CSDH proposed guidelines for minimum (see Table 1) and comprehensive national health equity surveillance systems, encouraging countries to build progressively towards the latter:

> It should include information on health inequities and determinants and the consequences of ill-health. Health information should be presented in a stratified manner, using both social and regional stratifiers. While health information for specified social groups should be included, the absolute level of health of disadvantaged groups in particular is an important indicator for policy-makers. In addition, measures that summarize the magnitude of health inequity between population groups should be included. It is advisable to include both a measure of relative and a measure of absolute health inequity, as these types of measure are complementary and findings can depend on which type is used (12).

A country's health equity surveillance system should draw upon nationally representative data that are available and comparable over time, including vital statistics to estimate mortality across age and social strata, and population survey and/or administrative data for morbidity data. Where applicable and available, good quality data on the health of Indigenous peoples should also be included in the health equity surveillance system.

TABLE 1: CSDH Recommendations for a Minimum Health Equity Surveillance System

INDICATOR	MEASURES OF INEQUITY
Mortality data: Infant mortality, adult mortality, and life expectancy indicators	**Gender-based stratification and analysis by sex**
Morbidity data: Minimum of three nationally relevant indicators	**Data stratification**: Minimum of two social markers (e.g. income, education, occupation, ethnicity/race) and one regional marker (e.g. province, rural versus urban)
Self-rated health data: Mental and physical health status indicators	**Summary measures:** Minimum one absolute and one relative health inequity measure

Source: Adapted from CSDH, 2008: 181.

Measuring Health Inequalities in Canada: Development of Indicators

The HIR Initiative builds on a solid foundation of work by others to strengthen the capacity to measure, monitor, and intervene on health inequalities in Canada (Box 3).

The starting point for the current work of the HIR Initiative was a set of indicators of health inequalities for Canada proposed by the PHN in 2009 (22). Developed by the PHN's Population Health Promotion Expert Group (PHPEG[4]), in response to the CSDH call for establishing national health equity surveillance systems, this proposed set of indicators was intended to support the measurement and monitoring of health inequalities in Canada and to facilitate collaborative action across jurisdictions. The PHPEG was guided by a series of expert workshops and consultations, commissioned reviews of the Canadian and international literature on health inequalities measurement and indicator development, assessments of health indicators currently used by Statistics Canada and CIHI, and consideration of available Canadian data sources.

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[4] The precursor to the current Healthy People and Communities Steering Committee.

Following the CSDH guidelines, the PHPEG developed and organized its proposed set of health inequalities indicators based on the categories outlined in the CSDH comprehensive health equity surveillance system framework (12). Among the criteria used to identify and select indicators were requirements that they:

- be reportable by a range of social group variables, including socioeconomic status (income and education levels), sex/gender, place of residence (rural/urban and province/territory disaggregations), Indigenous identity, and race/ethnicity;
- draw on data sources that are either currently available at the national, provincial, and regional levels or could be feasibly developed;
- be important and actionable;
- capture the essence of the issue;
- have a clear and acceptable interpretation;
- be valid and reliable; and
- reflect federal, provincial, and territorial policy priorities and areas of interest (22).

The PHPEG outlined its final list of proposed indicators of health inequalities for Canada in a 2009 report, which was subsequently approved by PHN Council (22). The PHN indicators have in turn formed the basis for the current work of the HIR Initiative.

BOX 3
MEASURING HEALTH INEQUALITIES IN CANADA-KEY MILESTONES (2004-2010)

2004: Statistics Canada and the Canadian Institute for Health Information (CIHI) host a Consensus Conference on Population Health Indicators to consider how to integrate an "equity dimension" into their existing Health Indicator Framework.

2004: The Health Disparities Task Group of the Federal/Provincial/Territorial (F/P/T) Advisory Committee on Population Health and Health Security call for enhancements to existing health information systems to improve health inequalities surveillance, monitoring, and reporting.

2005: F/P/T Health Ministers establish the Pan-Canadian Public Health Network (PHN) as a key intergovernmental mechanism to strengthen and enhance public health capacity in Canada and to enable F/P/T governments to take a collaborative approach to public health issues, improve health outcomes, and reduce health inequalities.

2006–2009: The Population Health Promotion Expert Group (PHPEG) of the Pan-Canadian PHN develops a set of indicators to measure and monitor the state of health inequalities in Canada.

2010: PHN Council approves the PHPEG's final report, *Indicators of Health Inequalities*.

The Pan-Canadian Health Inequalities Reporting Initiative

Building on the set of indicators proposed by PHN in 2010, the HIR Initiative brings together data on more than 70 indicators of health outcomes, risk factors, and social determinants of health disaggregated across a range of socioeconomic and sociodemographic variables meaningful to health equity (subject to data availability). These socioeconomic and sociodemographic variables include:

- sex/gender;
- age;
- income;
- education;
- employment;
- occupation;
- immigrant status;
- Indigenous identity;
- race/ethnicity;
- urban/rural residence;
- material and social deprivation
- functional health/participation and activity limitation; and
- sexual orientation.

The HIR Initiative provides a comprehensive and systematic baseline measure of the state of health inequalities in Canada. The Initiative is intended to support surveillance and research activities, inform policy and program decision-making to more effectively reduce health inequalities, and enable the monitoring of progress in this area over time.

The first major product of the HIR Initiative is the Health Inequalities Data Tool, an online, interactive statistical resource that allows users to access, explore, visualize, and download disaggregated data for the full set of more than 70 indicators. The Data Tool is housed on PHAC's Public Health Infobase: http://infobase.phac-aspc.gc.ca/health-inequalities/.

This report, the second major product of the HIR Initiative, draws on and complements the Data Tool by highlighting some of the most pronounced and widespread health inequalities in Canada as potential priority areas for action. Results for 22 key indicators of health inequalities across a range of social determinants of health, health behaviours, and health outcomes are examined by various social stratifiers defined by socioeconomic and sociodemographic population groups. These indicators were selected from the Data Tool using a combination of quantitative and qualitative criteria that took into account the magnitude of observed health inequalities and distribution across population groups; a balance between upstream and downstream determinants of health; coverage across social stratifiers; and alignment with federal, provincial, and territorial policy priorities. (For a detailed description of the key indicator selection process, see the Methodology chapter.)

This report draws on a number of national surveys and administrative databases to populate the indicators, including the Canadian Community Health Survey, Canadian Vital Statistics Database, and the Canadian Cancer Registry. While many of these sources capture data for First Nations people living off reserve, the Métis and the Inuit, most exclude First Nations people living on reserve and in northern communities. Helping to fill this information gap is the First Nations Regional Health Survey (RHS), the only First Nations–governed national health survey in Canada. The RHS, coordinated by the First Nations Information Governance Centre (FNIGC) in collaboration with its 10 Regional Partners, collects information about First Nations people living on reserve and in northern communities based on both Western and traditional understandings of health and well-being. In the present report, where applicable, national-level RHS data and contextual information for First Nations people living on reserve and in northern communities are provided by FNIGC. PHAC has worked in partnership with FNIGC to ensure that the inclusion of on-reserve First Nations data in this report is in compliance with

BOX 4
HEALTH INEQUALITIES IN CONTEXT – INDICATORS FOR INDIGENOUS POPULATIONS

Prepared by the First Nations Information Governance Centre

The indicators selected for this report are useful for highlighting health inequalities that exist between Indigenous and non-Indigenous peoples. They are also valuable for gauging progress towards the elimination of such inequalities. However, their limitations must also be acknowledged. On their own, these indicators are insufficient for creating programs and policies that contribute to improving the health of the population. In fact, if used incorrectly, these quantitative and deficit-based indicators may even be harmful, as they risk continuing to label Indigenous people with negative stereotypes. They do not incorporate Indigenous concepts of health and wellness, nor do they capture the notion of a collective or of relationships to other humans, animals, spirits, and/or animate objects such as mountains or water (23,24). Moreover, without adequate explanatory context about the historic, economic, political and social factors that have impacted Indigenous communities (e.g. inadequate infrastructure funding, discriminatory policies that limited access to loans or mortgages), indicators that focus solely on the problems in these communities can reinforce discriminatory attitudes towards Indigenous peoples.

Ultimately, an inclusive health assessment should reflect an understanding of the key values and priorities of the people in question. In order for health planning and action to be effective, Indigenous indicators must be community-driven, taking into consideration Indigenous peoples' worldviews, histories, and resources (24). When describing a population's health, a balanced approach in which strengths are equally presented alongside deficits is preferred. Rather than highlighting only the problems within a community, the identification of protective factors such as resilience, self-determination, and identity—and the inclusion of qualitative and culturally appropriate ways of capturing this knowledge—provides a more complete understanding of the issue and can be more effective in empowering and mobilizing individuals or a community towards improving health.

the First Nations principles of OCAP®. Standing for Ownership, Control, Access and Possession, OCAP® asserts that First Nations have control over data collection processes in their communities, and that they own and control how this information can be used. For more information on OCAP® principles, please visit: http://fnigc.ca/ocap.html.

Scope of this report

As the HIR Initiative is the first pan-Canadian attempt to systematically and comprehensively measure and report on the state of health inequalities in the country, it is important to state what is within the scope of this report. The report quantifies the absolute and relative inequalities in health outcomes, health-related behaviours, and social determinants of health among various population groups (social stratifiers), as well as the potential impact of these inequalities at the population level. It provides a broad portrait of the distribution, magnitude, and impact of health inequalities across population groups.

The report does *not* attempt to assess the causal relationship between social stratifiers and health outcomes or determinants. As well, it does not attempt to disentangle the multiple intersections between and among different social positions and/or different determinants of health, although it is acknowledged that health inequalities are driven by a complex system of social factors (i.e. structural and intermediary determinants of health) that remain to be fully explored and understood. Among population health scholars, more advanced analytical tools and techniques, such as complex systems methodologies (e.g. agent-based modelling, system dynamics, and discrete event simulation), are increasingly used to better understand how these dynamic, multilevel, interrelated factors contribute to health inequalities and population health (25).

While the HIR Initiative seeks to facilitate action to advance health equity in Canada through improved monitoring and reporting, it is beyond the scope of this report to assess or recommend specific policy and program interventions to reduce health inequalities or inequities.

Other chapters

Methodology: provides a detailed description of the HIR Initiative methodology, including the analytical approach to calculating health inequalities and the process used for selecting the 22 indicators featured in this report

Indicator chapters present the results for each indicator in turn (some indicators are combined thematically into a single chapter). The list of indicator chapters is as following: Inequalities in Life Expectancy and Health-Adjusted Life Expectancy; Inequalities in Infant Mortality; Inequalities in Unintentional Injury Mortality; Inequalities in Suicide Mortality; Inequalities in Perceived Mental Health (Low Self-rated Mental Health) and Mental Illness Hospitalization; Inequalities in Arthritis; Inequalities in Asthma; Inequalities in Diabetes; Inequalities in Obesity; Inequalities in Oral Health: Inability to Chew; Inequalities in Tuberculosis; Inequalities in High Alcohol Consumption; Inequalities in Smoking, Exposure to Second-Hand Smoke, and Lung Cancer Incidence; Inequalities in Early Development; Inequalities in Core Housing Need; Inequalities in Household Food Insecurity; and Inequalities in Working Poor.

Discussion and Implications: A brief concluding review of the key principles for action and the state of evidence on promising practices to reduce health inequalities.

References

(1) Health Disparities Task Group of the Federal/Provincial/Territorial Advisory Committee on Population Health and Health Security. Reducing health disparities: Roles of the health sector. 2005 .

(2) Butler-Jones D. The Chief Public Health Officer's report on the state of public health in Canada: 2008. Ottawa, ON: Public Health Agency of Canada; 2008.

(3) Canadian Institute for Health Information. Trends in income-related health inequalities in Canada. Ottawa, ON: CIHI; Revised July 2016 .

(4) Marmot M, Allen JJ. Social determinants of health equity. AJPH. 2014;104(S4):S517-9.

(5) Adler NE, Rehkopf DH. US disparities in health: descriptions, causes, and mechanisms. Annu Rev Public Health. 2008;29:235-52.

(6) Benjamin G, Goldman L, Hernandez S, et al. Advancing the health of communities and populations. National Academy of Medicine; 2016 .

(7) Whitehead M. The concepts and principles of equity and health. Health Promot Internation. 1991;6(3):217-28.

(8) Braveman PA, Kumanyika S, Fielding J, LaVeist T, Borrell LN, Manderscheid R, et al. Health disparities and health equity: the issue is justice. Am J Public Health. 2011;101(S1):S149-55.

(9) Braveman P. What are health disparities and health equity? We need to be clear. Public Health Rep. 2014;129(1_suppl2):5-8.

(10) The concern for equity in health. In: Anand S, Peter F, Sen A, editors. Public health, ethics, and equity: Oxford University Press on Demand; 2004.

(11) Venkatapuram S. On health justice. Some thoughts and responses to critics. Bioethics. 2016;30(1):49-55.

(12) Commission on Social Determinants of Health. Closing the gap in a generation: Health equity through action on the social determinants of health. Final report of the Commission on Social Determinants of Health.[Internet]. Geneva: World Health Organization; 2008 [cited 2017 Mar 31]. Available from: http://apps.who.int/iris/bitstream/10665/43943/1/9789241563703_eng.pdf.

(13) Solar O and Irwin A. A conceptual framework for action on the social determinants of health [Internet]. Geneva: WHO; 2007 [cited 2017 Jun 06]. Available from: http://www.who.int/sdhconference/resources/ConceptualframeworkforactiononSDH_eng.pdf.

(14) Reading C and Wien F. Health inequalities and social determinants of aboriginal peoples' health. Prince George, BC: National Collaborating Centre for Aboriginal Health; 2009.

(15) Inuit Tapiriit Kanatami . Social determinants of Inuit Health in Canada [Internet]. Ottawa: Inuit Tapiriit Kanatami; 2014 [cited 2017 Sep 29]. Available from: https://itk.ca/wp-content/uploads/2016/07/ITK_Social_Determinants_Report.pdf.

(16) Reading C. Structural determinants of aboriginal peoples' health. In: Greenwood M, De Leeuw S, Lindsay N, Reading C, editors. Determinants of aboriginal peoples' health; 2015. p. 1-15.

(17) Martens P, Bartlett J, Burland E, et al. Profile of Metis Health Status and Healthcare Utilization in Manitoba: A Population-Based Study [Internet]. Winnipeg: Manitoba Centre for Health Policy; 2010 [cited 2017 Sep 29]. Available from: http://mchp-appserv.cpe.umanitoba.ca/reference/MCHP-Metis_Health_Status_Full_Report_(WEB)_(update_aug11_2011).pdf.

(18) Loppie S, Reading C and de Leeuw S. Aboriginal experiences with racism and its impacts [Internet]. Prince George: National Collaborating Centre for Aboriginal Health; 2014 [cited 2017 Sep 29]. Available from: https://www.ccnsa-nccah.ca/docs/determinants/FS-AboriginalExperiencesRacismImpacts-Loppie-Reading-deLeeuw-EN.pdf.

(19) Waldram JB, Herring A, Young TK. Aboriginal health in Canada: Historical, cultural, and epidemiological perspectives. : University of Toronto Press; 2006.

(20) Dussault R, Erasmus G. Report of the royal commission on aboriginal peoples. 1996.

(21) Young IM. Equality of whom? Social groups and judgments of injustice. Journal of Political Philosophy. 2001;9(1):1-18.

(22) Pan-Canadian Public Health Network (Population Health Promotion Expert Group). Indicators of health inequalities. 2010.

(23) Anderson, M., Smylie, J., Anderson, I., Sinclair, R., Crengle, S. Discussion Paper No. 18. First Nations, Métis, and Inuit Health Indicators in Canada. A Background Paper for the project "Action Oriented Indicators of health and health systems Development for Indigenous Peoples in Australia, Canada, and New Zealand" [Internet]. Melbourne: Onemda VicHealth Koori Health Unit; 2006 [cited 2017 Sep 29]. Available from: http://onemda.unimelb.edu.au/sites/default/files/docs/dP18.pdf.

(24) Donatuto J, Campbell L, Gregory R. Developing responsive indicators of indigenous community health. International journal of environmental research and public health. 2016;13(9):899.

(25) Kaplan G, Diez Roux A, Galea S, Simon C editors. Growing inequality: bridging complex systems, population health, and health disparities. : Washington, DC: Westphalia Press. Google Scholar; 2016.

(26) Marmot M. Social justice, epidemiology and health inequalities. Eur J Epidemiol. 2017;32(7):537-46.

METHODOLOGY

ACRONYM	FULL NAME
AF	Attributable Fractions
BMI	Body Mass Index
CBDB	Canadian Birth Database
CCHS	Canadian Community Health Survey
CCR	Canadian Cancer Registry
CIs	Confidence Intervals
CMDB	Canadian Mortality Database
CSD	Canadian Survey on Disability
CTBRS	Canadian Tuberculosis Reporting System
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4th Edition
EDI	Early Development Instrument
FNIGC	First Nations Information Governance Centre
HALE	Health-Adjusted Life Expectancy
HIR	Health Inequalities Reporting
HMHDB	Hospital Mental Health Database
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10th revision
ICD-10-CA	International Statistical Classification of Diseases and Related Health Problems, 10th revision, Canada
ICD-O-3	International Classification of Diseases for Oncology, 3rd edition
LGBT	Lesbian, Gay, Bisexual and Transgender
NHS	National Household Survey
PAF	Population Attributable Fraction
PAR	Population Attributable Rate
PHAC	Public Health Agency of Canada
PHN	Pan-Canadian Public Health Network
PHPEG	Population Health Promotion Expert Group
PIN	Population Impact Number
RD	Rate Difference
RHS	First Nations Regional Health Survey
RR	Rate Ratio

1) Introduction

Effective interventions and policies to address health inequities rely on the systematic and routine measurement and monitoring of health inequalities and indicators that represent key social determinants of health (1). The monitoring of health inequalities experienced by different population groups allows us to observe the size and pattern of inequalities and identify subpopulations that have adverse health trends. Measurement and monitoring provide the necessary foundation to guide further research into the root causes of health inequalities; inform the development of equity-oriented policies to improve population health; and evaluate the impact of interventions.

The development of the Pan-Canadian Health Inequalities Reporting (HIR) Initiative was spearheaded by the Pan-Canadian Public Health Network (PHN), an intergovernmental body constituted in 2005 by federal, provincial, and territorial Ministers of Health to strengthen and enhance public health capacity in Canada. Since 2006, the PHN and its Population Health Promotion Expert Group (PHPEG)—and subsequently the PHN's Healthy People and Communities Steering Committee—have led the development of a set of indicators of health inequalities and determinants of health inequalities best suited to the Canadian context. Key drivers of this work included *Closing the gap in a generation: health equity through action on the social determinants of health*, the final Report of the World Health Organization Commission on Social Determinants of Health (1), the recommendations of *A Healthy, Productive Canada: A Determinant of Health Approach*, the final report of the Senate Subcommittee on Population Health (2), and the Rio Political Declaration on Social Determinants of Health (3).

Health inequalities monitoring systems use disaggregated data to reveal how health outcomes, behaviours, and determinants are distributed throughout population groups. As in any surveillance process, monitoring health inequalities requires selecting relevant indicators, obtaining and analyzing the data, and reporting the results. Choosing a set of national indicators requires a systematic, comprehensive, and iterative process that involves several steps and multiple stakeholders.

In 2013, the HIR Initiative—led by the Public Health Agency of Canada (PHAC) in partnership with the PHN, Statistics Canada, and Canadian Institute of Health Information—began to undertake a comprehensive baseline analysis of over 70 indicators to measure health inequalities in Canada. (This analysis is available via the Health Inequalities Data Tool.) The magnitude and population impact of inequalities were estimated for each indicator using six measures, with results stratified by as many as 13 different socioeconomic and sociodemographic population groups, generating the largest and most comprehensive dataset on health inequalities in Canada.

This chapter describes the methodologies used to calculate the inequalities. It outlines the process for selecting the most pronounced and policy-relevant indicators of inequalities presented in this baseline report. These, in turn, will provide a foundation for future analysis, allowing for comparisons and monitoring of inequalities over time as a critical step in facilitating action to advance health equity.

2) Analytic Approach

In 2009, based on a comprehensive review of evidence of health inequalities in Canada and comparable indicators used in other countries, the PHN's Population Health Promotion Expert Group[5] recommended a list of indicators of health inequalities and equity stratifiers(4). Based on this initial list, the HIR Initiative chose approximately 70 indicators for monitoring based on the WHO health equity conceptual framework (5). These indicators included both health outcomes (such as mortality, morbidity, self-assessed health measures and cause-specific outcomes) and health determinants (such as health behaviours, working conditions, physical and social environments, demographic characteristics and measures of socioeconomic status) (4). Data for all indicators are available through the Health Inequalities Data Tool.

Accessing the data

From this full set of over 70 indicators, 22 indicators of key health inequalities in Canada were selected for inclusion in this report (see Key Indicators Selection, below).

The indicators in this report draw on data from the following national administrative and survey data sources (and respective data custodians):

- Vital Statistics – Canadian Mortality Database (CMDB) (Statistics Canada);
- Vital Statistics – Canadian Birth Database (CBDB) (Statistics Canada);
- Canadian Cancer Registry (CCR) (Statistics Canada);
- Hospital Mental Health Database (HMHDB) (CIHI);
- Canadian Community Health Survey (CCHS) (Statistics Canada);
- Canadian Survey on Disability (CSD) (Statistics Canada);
- National Household Survey (NHS) (Statistics Canada);
- Offord Centre for Child Studies; (Offord Centre for Child Studies);
- Canadian Tuberculosis Reporting System (CTBRS) (PHAC); and

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5. The precursor to the current Healthy People and Communities Steering Committee.

- First Nations Regional Health Survey (RHS) (First Nations Information Governance Centre) (see Box 1).

In order to have a large enough sample size for stratifying population groups, several years of data were combined whenever necessary and available. For example, 3 years of data were combined for the CMDB (2009–2011) and the CCR (2008-2010) database, and 4 years of data (2009–2012) for the HMHDB. For the CCHS and the CTBRS, 4 years and 5 years of data, respectively, were combined.

Table 1 lists each indicator profiled in this report along with a definition, the time period of observation, and the data source.

BOX 1

HEALTH INEQUALITIES DATA FOR FIRST NATIONS PEOPLE LIVING ON RESERVE AND IN NORTHERN COMMUNITIES

Prepared by the First Nations Information Governance Centre

While many national health surveys in Canada, including those used in this report, capture data for First Nations people living off reserve, the Métis, and the Inuit, most exclude First Nations people living on reserve and in northern communities. Helping to fill this information gap is the First Nations Regional Health Survey (RHS), the only First Nations–governed national health survey in Canada. The RHS, coordinated by the First Nations Information Governance Centre (FNIGC) in collaboration with its 10 Regional Partners, collects information about First Nations people living on reserve and in northern communities based on both Western and traditional understandings of health and well-being.

Where applicable, the present report includes RHS data and contextual information provided by FNIGC. To complement information from the CCHS, data from the RHS are reported in the following chapters: arthritis, asthma, diabetes, obesity, smoking, heavy alcohol consumption, and perceived mental health (among youth). In addition, food insecurity data from the RHS are compared to values from the Aboriginal Peoples Survey, and oral health data from the First Nations Oral Health Survey are compared to values from the Canadian Health Measures Survey.

Table 1. Definitions of the Selected Key Indicators

CATEGORY	INDICATOR	INDICATOR DEFINITION	DATA SOURCES (YEAR)
Health Status			
Life expectancy	Life expectancy at birth (ecological level)	The number of years a person would be expected to live, in total, on the basis of the mortality statistics for a given observation period	CMDB (2009–2011)
	Health-adjusted life expectancy (HALE) at age 18 years (individual level)	The number of years a person would be expected to live in a healthy state, starting at age 18 years, on the basis of the mortality statistics for a given observation period	CCHS–CMDB linked database (2000–2011)
Mortality	Infant mortality – weight ≥500 grams	Crude rate of infants weighing ≥500 grams who die in the first year of life, expressed per 1 000 live births	CBDB–CMDB linked database (2008–2011)
	Unintentional injury mortality – all ages	Crude and age-standardized rate of deaths caused by unintentional injuries per 100 000 population. Unintentional injuries include injuries due to motor vehicle collisions, falls, drowning, burns, and poisoning, etc., but not medical misadventures/complications (ICD-10 V01 to X59, Y85 to Y86)	CMDB (2009–2011)
Mental illness	Intentional self-harm/suicide – all ages	Crude and age-standardized rate of suicide deaths (ICD-10 X60 to X84) per 100 000 population	CMDB (2009–2011)
	Mental illness hospitalization ages 15+ years	Crude and age-standardized rate of separations from general and psychiatric hospitals through discharge following hospitalizations for five selected mental illness conditions combined, per 100 000 population: substance-related disorders (ICD-10-CA: F55, F10 to F19; DSM-IV: 291, 292, 303, 304, 305); schizophrenia, delusional and non-organic psychotic disorders (ICD-10-CA: F20, F22, F23, F24, F25, F28, F29; DSM-IV: 295, 297, 298); mood/affective disorders (ICD-10-CA: F30 to F34, F38.0, F38.1, F38.8, F39, F53.0; DSM-IV: 296, 300.4, 311); anxiety disorders (ICD-10-CA: F40, F41, F42, F43.0, F43.1, F43.8, F43.9, F93.0, F93.1, F93.2; DSM-IV: 300.0, 300.2, 300.3, 308.3, 309.8); and selected disorders of adult personality and behaviour (ICD-10-CA: F60, F61, F62, F68, F69; DSM-IV: 301)	HMHDB (2009–2012)
Self-assessed health	Perceived mental health – fair or poor age 18+ years (RHS: age 12–17 years)	Crude and age-standardized percentage of people who reported their own mental health status as being either "fair" or "poor"	CCHS (2010–2013); RHS (2008–2010)

CATEGORY	INDICATOR	INDICATOR DEFINITION	DATA SOURCES (YEAR)
Cause-specific outcomes	Arthritis age 18+ years	Crude and age-standardized percentage of people who reported that they have been diagnosed by a health professional as having arthritis	CCHS (2010–2013); RHS (2008–2010)
	Asthma age 18+ years	Crude and age-standardized percentage of people who reported that they have been diagnosed by a health professional as having asthma	CCHS (2010–2013); RHS (2008–2010)
	Diabetes – excluding gestational age 18+ years	Crude and age-standardized percentage of people who reported that they have been diagnosed by a health professional as having diabetes (excluding gestational diabetes)	CCHS (2010–2013); RHS (2008–2010)
	Disability age 18+ years	Crude and age-standardized percentage of individuals aged 15+ with a mild, moderate, severe, or very severe disability (identified as such if an individual's daily activities are limited as a result of an impairment or difficulty with particular tasks)	CSD (2012)
	Lung cancer incidence	Crude and age-standardized rate of new primary cases of lung cancer (ICD-O-3: C34.0 to C34.9) per 100 000 population	CCR (2008–2010)
	Obesity age 18+ years	Crude and age-standardized percentage of people with a body mass index (BMI) score ≥30.0 kg/m^2 (based on self-reported height and weight)	CCHS (2010–2013); RHS (2008–2010)
	Oral health – no ability to chew age 18+ years	Crude and age-standardized percentage of people who reported limitations in ability to chew firm food (e.g. meat) or a fresh apple.	CCHS (2007–2008)
	Tuberculosis	Crude rate of reported active tuberculosis cases (newly diagnosed or re-treatment) per 100 000 population	CTBRS (2010–2014)
Health Determinants			
Health behaviours	Alcohol use – heavy drinking	Crude and age-standardized percentage of people who reported having had ≥5 drinks in one occasion at least once a month over the past year	CCHS (2010–2012); RHS (2008–2010)
	Smoking age 18+ years	Crude and age-standardized percentage of people who reported being a current smoker (either daily or occasional)	CCHS (2010–2013); RHS (2008–2010)
Physical and social environment	Core housing need	Crude and age-standardized percentage of people for whom housing is either not affordable (costs more than 30% of before-tax household income), in need of major repair, or has an inadequate number of bedrooms for the size and make-up of resident households not of sufficient size	NHS (2011)
	Exposure to second-hand smoke at home age 18+ years	CCHS: Crude and age-standardized percentage of current non-smokers who reported that at least one person smoked inside their home every day or almost every day RHS: Crude and age-standardized percentage of adults who reported having a smoke-free home (analysis limited to those who reported being current non-smokers)	CCHS (2010–2013); RHS (2008–2010)

CATEGORY	INDICATOR	INDICATOR DEFINITION	DATA SOURCES (YEAR)
Social inequities	Food insecurity – household	CCHS: Crude and age-standardized percentage of people living in households with moderate to severe food insecurity, measured by whether they were experiencing multiple food deprivation issues, such as having to use food banks, going without fresh fruit and vegetables, and buying cheap food to make ends meet. Derived from self-reports on income-related difficulties accessing or utilizing food that influence the quantity or quality of food consumed	CCHS (2009–2012)
	Working poor	Crude and age-standardized percentage of people aged 18–64 years living independently and away from their family of origin who reported earning at least $3 000 per year and excluding full-time students whose after-tax income is below the low income measure (LIM)	NHS (2011)
Early childhood development	Vulnerability in early childhood development ages 4–6 years	Crude percentage of kindergarten children (ages 4–6 years) who are vulnerable in ≥1 of the following developmental domains upon entry into school: • Physical health and well-being (physical readiness for the school day, physical independence, gross and fine motor skills); • Social competence (overall social competence, responsibility and respect, approaches to learning, and readiness to explore new things); • Emotional maturity (prosocial and helping behaviour, anxious and fearful behaviour, aggressive behaviour, and hyperactivity and inattention); • Language and cognitive development (basic literacy, interest in literacy/numeracy and memory, advanced literacy, and basic numeracy); • Communication skills and general knowledge. Children whose score falls in the lowest tenth percentile for a given domain are deemed "vulnerable" in that area. Children who are vulnerable in more than one domain are categorized as "vulnerable" in terms of their development upon entry into school.	Early Development Instrument (EDI) (The single most recent school year of implementation of the instrument for each province or territory: British Columbia: 2010/11 Saskatchewan: 2010/11 Manitoba: 2010/11 Ontario: 2011/12 Quebec: 2011/12 New Brunswick: 2008/09 Prince Edward Island: 2007/08 Yukon: 2011/12 Northwest Territories: 2011/12)

CBDB: Vital Statistics – Birth Database; CCR: Canadian Cancer Registry; CCHS: Canadian Community Health Survey; CMDB: Vital Statistics – Death Database; CSD: Canadian Survey on Disability; CTBRS: Canadian Tuberculosis Reporting System; DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, 4th edition; EDI: Early Development Instrument; HMHDB: Hospital Mental Health Database; ICD-10: International Statistical Classification of Diseases and Related Health Problems, 10th revision; ICD-10-CA: International Statistical Classification of Diseases and Related Health Problems, 10th revision, Canada; ICD-O-3: International Classification of Diseases for Oncology, 3rd edition; NHS: National Household Survey; RHS: First Nations Regional Health Survey

Choosing social stratifiers

The WHO Commission on Social Determinants of Health (1) and the 2010 PHN report (4) recommended that health inequalities be analysed and reported with available data stratified by a range of population groups and any other distinctive characteristics of population meaningful to health inequities. Accordingly, where feasible, health outcomes and health determinants data were analysed for each of the following social stratifiers (8-14) (Annex 1):

- Sex/gender
- Indigenous identity * (see Box 1)
- Cultural/racial background*
- Sexual orientation*
- Functional health *
- Participation and activity limitation*
- Immigrant status*
- Income *
- Education*
- Employment
- Occupation*
- Material and social deprivation*
- Urban/rural residence*

While all of the data sources collect information solely on individuals' sex, in this report we refer to this as sex/gender based on the assumption that health inequalities between men and women are driven by the interplay of biologically and socially determined constructs of sex and of gender.

Information for these stratifiers is available at the individual-level for survey data, including CCHS, NHS and CSD. However, many of the above stratifiers are not available for administrative data such as CBDB, CMDB, HMHDB, and CCR. Some missing stratifiers, such as income, education, Indigenous identify, immigrant status, material and social deprivation index, were derived from Census data using residential information (postal code) included in the administrative data. Detailed information about these individual-level and area-based stratifiers is included in Annex 1.

*Each of these social stratifiers was further disaggregated by sex/gender (see Figure 1).

Calculating inequalities

Measuring and monitoring of health inequalities requires reporting both absolute and relative measures whenever possible because both absolute and relative measures may diverge in magnitude or direction of change, leading to different conclusions (1,6). Measures of absolute inequality quantify the difference of a health outcome in disadvantaged populations when compared with the advantaged group. They also quantify the potential gains to overall population health from reducing these inequalities. Relative inequality measures quantify the proportional inequality between groups; they are useful when comparing inequalities across outcomes measured on different scales (that is, comparing the inequalities between a subpopulation and the reference group across different indicators). Reporting both absolute and relative measures increases transparency, reduces systematic reporting bias, and improves the evidence base for policies aiming to reduce health inequalities (6,7).

The choice of inequality measures was informed by the *Handbook on health inequality monitoring: with a special focus on low- and middle-income countries* (8) and refined in discussions with the project's advisory group, the Pan-Canadian Baseline Report on Health

FIGURE 1

Summary of analytical approach

INDICATORS

HEALTH STATUS

Including indicators for:

- Life expectancy and health-adjusted life expectancy
- Mortality and disability
- Perceived physical and mental health
- Infectious and chronic diseases

HEALTH DETERMINANTS

Including indicators for:

- Health behaviours
- Early childhood development
- Physical and social environments
- Working conditions
- Access to health care
- Social protection
- Social inequities

▼

SOCIAL STRATIFIERS

SOCIOECONOMIC STATUS

- Income
- Education
- Employment
- Occupation
- Material and social deprivation

INDIGENOUS PEOPLES

- First Nations
- Inuit
- Métis

PLACE OF RESIDENCE

- Rural/Urban

POPULATION GROUP

- Age
- Immigrant status
- Sexual orientation
- Functional health
- Cultural/racial background

SEX: Male or Female

JURISDICTION: National or Provincial/Territorial

Inequalities Technical Working Group[6]. For all measures, the reference group used for comparison among population groups was that which was presumed to be the most socially advantaged.

The following steps were taken to assess the magnitude and impact of inequalities:

(1) Overall crude and age-standardized prevalence, incidence, and mortality rates (with their associated 95% confidence intervals [95% CIs]) were calculated for all stratified population

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[6] The Technical Working Group was established to provide advice on methodology, data analysis, and interpretation of results for the HIR Initiative, and is comprised of academic, Federal/Provincial/Territorial and public health institutional experts in health inequalities measurement and monitoring, in addition to representatives from the HIR Initiative's core partners (the Public Health Agency of Canada, Pan-Canadian Public Health Network, Canadian Institute for Health Information, and Statistics Canada).

groups of the selected indicators. Rates were calculated as event rates per 100 000 (e.g. mortality, incidence of tuberculosis, and mental illness hospitalization rate) or 1 000 (e.g. infant mortality) in a given year or as a weighted proportion of survey respondents per 100 population (e.g. asthma and smoking) (Annex 2). Sex/gender-specific prevalence, incidence, and mortality rates were also calculated for each social stratifier. Stratification by age group was performed only for indicators such as food insecurity, asthma, suicide, and unintentional injuries, where inequities by age have been evident in the Canadian context. Rates were age standardized by the direct method using the 2011 Canadian population (Annex 2). For formulas for calculating crude rates and age-standardized rates as well as their corresponding 95% confidence intervals, see Annex 3.

(2) To quantify the magnitude of inequalities, the following measures were calculated for each indicator:

- prevalence, incidence, and/or mortality rate ratios and rate differences, which assess the relative and absolute differences between the rates for the most and least advantaged groups, respectively; and
- attributable fractions (AF %), which measure the potential percentage of prevalence/rate reduction that could be achieved by a particular population (usually the less advantaged group) if it had the same rate as the reference (the most advantaged) group.

(3) To quantify the population impact of inequalities, the following measures were calculated for each indicator:

- the population attributable rate (PAR), or the rate of an outcome in the total population if a particular subpopulation had the same outcome rate as the reference (most advantaged) group;
- the population attributable fraction (PAF), or the reduction in the rate of an outcome in the total population if a particular subpopulation had the same rate as the reference (most advantaged) group; and
- the population impact number (PIN), or the reduction in the number of cases if a particular subpopulation had the same outcome rate as the reference group.

The definitions, interpretations, and examples of these summary measures can be found in the document "Pan-Canadian Health Inequalities Reporting Initiative Summary Measures" (https://infobase.phac-aspc.gc.ca/health-inequalities/inequality-measures-en.aspx) on the Health Inequality Data Tool. Formulas to calculate the summary measures and their 95% confidence intervals are available in Annex 3.

(4) Data reportability was then verified according to the suppression rules described in Annex 4.

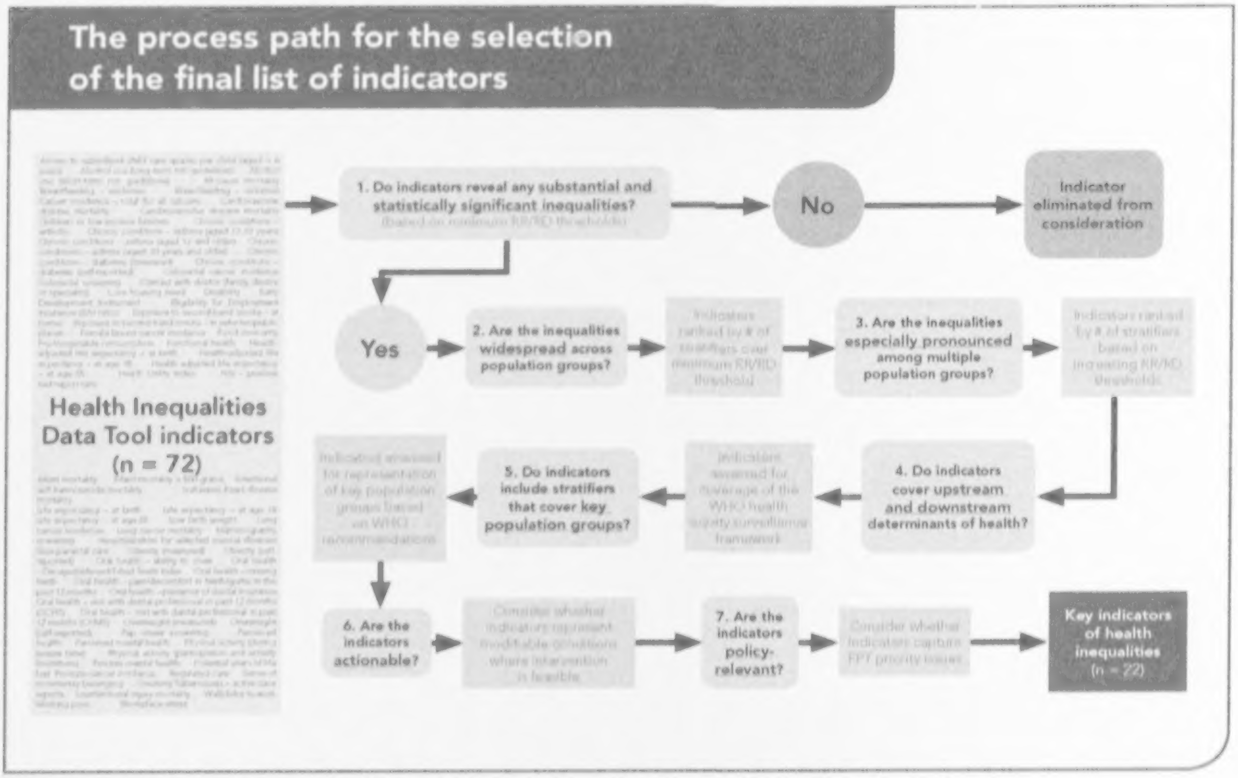
3) Key Indicators Selection

Reporting on the most pronounced inequalities requires measuring the extent of inequalities across multiple population groups. "Key" indicators were selected based on the size of the inequalities and their level of priority within the public health agenda. This section describes the systematic approach used to identify the most pronounced inequalities and to select the key inequality indicators presented in this report.

Identifying key indicators involved two major steps (Figure 2):

1. Quantitative ranking: a systematic filtering approach ensured that data were ranked according to the magnitude of relative and absolute inequalities and the number of population subgroups affected; and

FIGURE 2



The process path for the selection of the final list of indicators

Health Inequalities Data Tool indicators (n = 72)
1. Do indicators reveal any substantial and statistically significant inequalities? (Based on minimum RR/RD thresholds)
No
Indicator eliminated from consideration
Yes
2. Are the inequalities widespread across population groups?
Indicators ranked by # of stratifiers over minimum RR/RD threshold
3. Are the inequalities especially pronounced among multiple population groups?
Indicators ranked by # of stratifiers based on increasing RR/RD thresholds
4. Do indicators cover upstream and downstream determinants of health?
Indicators assessed for coverage of the WHO health equity surveillance framework
5. Do indicators include stratifiers that cover key population groups?
Indicators assessed for representation of key population groups based on WHO recommendations
6. Are the indicators actionable?
Consider whether indicators represent modifiable conditions where intervention is feasible
7. Are the indicators policy-relevant?
Consider whether indicators capture FPT priority issues
Key indicators of health inequalities (n = 22)

2. Qualitative assessment: an additional filtering approach assessed indicators based on policy relevance at the federal, provincial, and territorial levels, susceptibility to intervention, and representation of indicators from different domains (health status, health behaviours, and the structural determinants of health).

Step 1: Quantitative Ranking of Indicators

One absolute measure of inequality (rate difference) and one relative measure of inequality (rate ratio) were used in the quantitative ranking of indicators to determine the magnitude of inequality experienced by different population groups.

Quantitative ranking of indicators consisted of several critical steps.

(1) The summary measures' values were assessed to confirm:

- national level data coverage;
- a minimal degree of non-reportable summary measures; and
- a minimal degree of statistically significant inequalities.

(2) Three increasing numerical thresholds were established using descriptive statistics (e.g. mean, median) for rate difference and rate ratio values of each indicator.

(3) Using these successive numerical thresholds, the summary measure values were filtered in order to rank the indicators as having high, medium, or low inequalities. A value of 1 was assigned to each category (subpopulation group) each time the summary measure for that group met these thresholds. The final ranking of indicators was based on the summed score for each indicator (Annex 5).

This approach identified those indicators that showed the most pronounced and widespread inequalities across population groups. Approximately half of the top-ranked indicators and their respective population groups were then mapped against the Commission on Social Determinants of Health framework for health equity surveillance (9) ensuring representation of key population groups and health indicator domains (Health Status, Health Determinants: Daily Living Conditions, Health Determinants: Structural Drivers).

Step 2: Qualitative prioritization of indicators

The indicators with the highest level of inequality for multiple key population groups were examined with respect to three different but not mutually exclusive criteria:

- susceptibility to intervention;
- policy relevance for federal, provincial, and territorial jurisdictions; and
- international comparability.

Examining the indicators in light of these criteria involved multiple consultations with subject matter experts and program and policy experts while reviewing existing frameworks and environmental scans that summarize federal/provincial/territorial public health priorities. Limitations to do with the availability of data for indicators and population groups, and the use of complex area-based measures in place of individual-level data were also discussed with stakeholders.

This consultation and assessment ensured that the selected indicators reflected the policy priorities of federal, provincial, and territorial jurisdictions across Canada and were reasonably consistent with international monitoring. Taken together, the quantitative ranking and qualitative assessment provides a scientifically robust and policy-relevant snapshot of key health inequalities in Canada. The proposed final list of key inequality indicators was approved by the PHN Council, and constitutes the core of this report.

FIGURE 3

Baseline list of key indicators in Canada, 2016/17

HEALTH OUTCOMES	**Life expectancy and mortality**	• Life expectancy at birth (ecological level) & Health-adjusted life expectancy at age 18 years (individual level) • Infant mortality – weight ≥ 500 grams • Unintentional injury mortality – all ages
	Mental illness	• Intentional self-harm/suicide – all ages • Mental illness hospitalization ages 15+ years
	Self-assessed health	• Perceived mental health – fair or poor age 18+ years
	Cause-specific outcomes	• Arthritis age 18+ years • Asthma age 18+ years • Diabetes – excluding gestational age 18+ years • Disability age 18+ years • Lung cancer incidence • Obesity – age 18+ years • Oral health – no ability to chew age 18+ years • Tuberculosis
HEALTH DETERMINANTS [Daily Living Conditions]	**Health behaviours**	• Alcohol use – heavy drinking • Smoking age 18+ years
	Physical and social environment	• Core housing need • Exposure to second-hand smoke at home age 18+ years
HEALTH DETERMINANTS [Structural Drivers]	**Social inequities**	• Food insecurity – household • Working poor
	Early childhood development	• Vulnerability in early Childhood development ages 5–6 years

The final set of baseline key inequality indicators resulted from a comprehensive and iterative process that involved critical conceptual and technical decisions and consultations with multiple stakeholders. This set represents both current public health priorities and the largest differences in health outcomes in Canada. Both are affected by the availability of data, changes in population health patterns, and emerging public health priorities. Consequently, this set of indicators is subject to future revisions and updates (Figure 3).

4) Gaps and Limitations

The inequalities presented in this report constitute a comprehensive baseline measure of inequalities in Canada. All analysis and findings are based on current and extensive population-based Canadian datasets. They rely on the best available operationalization of the available information at the time of analysis. Data gaps and limitations should be considered when interpreting the estimated magnitude of inequalities, and for any potential comparisons or future monitoring of observed inequalities.

Many of the data sources used for this report are surveys with unique sampling frames. The populations excluded in these surveys are listed in Annex 6. Moreover, due to limitations in data availability, some indicators recommended by PHN for monitoring of health inequalities were not available, such as child immunization rate, water quality (number of boil water advisory days), and homelessness rate.

The descriptive analyses undertaken did not take into account the complex interactions between multiple social identities and social determinants of health. The measurement of health inequalities in this project is based on the assumption that the health status of the most advantaged group is achievable by the other population groups if the social and structural drivers of health inequalities were addressed. For example, PAF measures the proportion by which an outcome would be reduced in the total population in the hypothetical situation where one population group had the same rate as the reference group. Future analysis could include multivariate modelling to explore associations between multiple stratifiers and indicators while adjusting for potential confounders.

Data presented in the report are cross-sectional in nature. As such, they are intended to capture the depth and impact of inequalities on different stratified groups, rather than to assess the strength or direction of an association between the social stratifiers and the indicators. For example, arthritis prevalence was higher among those unable to work. While this may be because those who were unable to work were at an increased risk of developing arthritis, it may also be that arthritis interfered with the ability to be employed. The disproportionate burden of health experienced by these population groups remains to be fully explored and understood.

Data for certain subpopulations were not available in some data sources. For example, the Canadian Mortality Database does not collect data on social determinants of health such as race/ethnicity, Indigenous identity, immigration status and lesbian, gay, bisexual and transgender (LGBT) status. In other instances, results could not be reported because sample sizes were too small or because of data suppression rules (Annex 4). For example, data for Canadians who identify as bisexual and data for some cultural/racial groups were suppressed for some indicators.

Income, education, immigrant status, Indigenous identity, rural/urban residence, and material and social deprivation index are stratifiers with area-based measures derived at the dissemination area level based on the 2006 Census (10). A dissemination area is a small area composed of one or more neighbouring dissemination blocks with an average population of 400 to 700 people. It is the smallest standard geographical area for which all Census data are disseminated. Area-based measures derived at the level of the dissemination area are subject to certain biases; observations apply to the area level and not to every individual within the dissemination area, potentially leading to misclassification of socioeconomic characteristics. For example, higher suicide rates were observed in people living in areas with lower incomes; however, these higher suicide rates do not necessarily refer to individuals with low income. Rather, the rate may reflect individuals with high income who died by suicide while living in low income settings.

Whereas some studies have found that using area-based data rather than individual-level data for socioeconomic characteristics can lead to underestimating inequalities in health (10-13), others have observed a similar magnitude of health inequality for both types of data. Yet other studies suggest that area-based socioeconomic status measures may reflect a construct that is distinct from individual-level ones (14-16).

Another limitation of area-based social stratifiers is that they exclude people with invalid, incomplete, or missing postal codes[7]. Also, area-based social stratifiers were derived from the 2006 Census; as most indicators were derived from data until 2013 or 2014, data used from the 2006 Census might not reflect the socioeconomic situation in the years after 2006.

Despite these limitations, area-based socioeconomic data are useful for assessing inequalities in health. To monitor socioeconomic inequalities in health, the inequalities identified by area-based socioeconomic status measures are valid, consistent, and reliable and can be tracked through time for different geographical settings (10,14,17-19).

Finally, all survey data include only First Nations people living off reserve. Lack of data for First Nations people living on reserve is a limitation in the reported prevalence estimates for indicators derived from survey data. However, these data are complemented by data from the Regional Health Survey (RHS) that is collected by the First Nations Information Governance Centre and its regional partners. This data source provides comparable data for some indicators for First Nations people living on reserve and in northern communities.

In addition, data sources have lower coverage of Indigenous populations, including certain northern communities where a large proportion of Inuit live. For example, the CCHS (8) covers 92% of the targeted population in the Yukon and 96% of the targeted population in the Northwest Territories; however, the coverage was only 71% in Nunavut before 2013 because the CCHS covered only the 10 largest communities until then. Since 2013, coverage has been expanded to represent 92% of the targeted population. It should also be noted that the Quebec region of Nunavik (Région du Nunavik) is not covered by the CCHS. Coverage is also affected by the fact that there are some incompletely enumerated First Nations reserves and communities. As a result, the inhabitants of these places were not counted in the 2011 NHS (20). This affects the representativeness of Indigenous populations and, consequently, the health inequalities reported. Finally, data coverage for Métis peoples is also affected by factors such as geography. While individuals identifying as First Nations and Inuit tend to live in dissemination areas that have either a high or a low proportion of individuals who identify as such, those identifying as Métis live almost exclusively in areas where the concentration of people identifying as Métis is low (21). This could potentially increase the misclassification of health inequalities reported for Métis peoples where area-based measures were used as described above.

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[7] However, if the sampling frame included institutionalized residents (i.e. people living in hospitals, nursing home, seniors' residences, prisons and other institutional residences), they were retained in the analysis.

References

(1) Commission on Social Determinants of Health. Closing the gap in a generation: health equity through action on the social determinants of health. Final report of the Commission on Social Determinants of Health [Internet]. Geneva: World Health Organization; 2008 [cited 2017 Mar 18]. Available from: http://apps.who.int/iris/bitstream/10665/43943/1/9789241563703_eng.pdf.

(2) Keon WJ and Pepin L. A Healthy, Productive Canada: A Determinant of Health Approach: Final Report of Senate Subcommittee on Population Health [Internet]. Ottawa: Senate; 2009 [cited 2017 Jun 06]. Available from: http://publications.gc.ca/collections/collection_2009/sen/YC17-402-3-01E.pdf.

(3) World Health Organization. Rio political declaration on social determinants of health [Internet]. Rio de Janeiro: WHO; 2011 [cited 2017 Jun 06]. Available from: http://www.who.int/sdhconference/declaration/en/.

(4) Hancock T, Bourgoin M, Hayes M, et al. Indicators of health inequalities. A report from the Population Health Promotion Expert Group and the Healthy Living Issue Group for the Pan-Canadian Public Health Network [Internet]. Ottawa: Pan-Canadian Public Health Network; 2010 Available from: http://www.phn-rsp.ca/pubs/ihi-idps/index-eng.php.

(5) Solar O and Irwin A. A conceptual framework for action on the social determinants of health [Internet]. Geneva: WHO; 2007 [cited 2017 Jun 06]. Available from: http://www.who.int/sdhconference/resources/ConceptualframeworkforactiononSDH_eng.pdf.

(6) King NB, Harper S, Young ME. Use of relative and absolute effect measures in reporting health inequalities: Structured review. BMJ (Online). 2012;345(7878).

(7) Harper S, Lynch J, Meersman SC, Breen N, Davis WW, Reichman ME. An overview of methods for monitoring social disparities in cancer with an example using trends in lung cancer incidence by area-socioeconomic position and race-ethnicity, 1992-2004. Am J Epidemiol. 2008;167(8):889-99.

(8) World Health Organization. Handbook on health inequality monitoring: with a special focus on low-and middle-income countries. : World Health Organization; 2013.

(9) Commission on Social Determinants of Health. Closing the gap in a generation: health equity through action on the social determinants of health [Internet]. Geneva, Switzerland: World Health Organization; 2008 Available from: http://apps.who.int/iris/bitstream/10665/43943/1/9789241563703_eng.pdf.

(10) Pampalon R, Hamel D, Gamache P. A comparison of individual and area-based socio-economic data for monitoring social inequalities in health. Health Reports. 2009;20(4):85.

(11) Southern DA, McLaren L, Hawe P, Knudtson ML, Ghali WA, APPROACH Investigators. Individual-level and neighborhood-level income measures: agreement and association with outcomes in a cardiac disease cohort. Med Care. 2005 Nov;43(11):1116-22.

(12) Walker A, Becker N. Health inequalities across socio-economic groups: comparing geographic-area-based and individual-based indicators. Public Health. 2005;119(12):1097-104.

(13) Smith GD, Hart C, Watt G, Hole D, Hawthorne V. Individual social class, area-based deprivation, cardiovascular disease risk factors, and mortality: the Renfrew and Paisley Study. J Epidemiol Community Health. 1998 Jun;52(6):399-405.

(14) Subramanian S, Chen JT, Rehkopf DH, Waterman PD, Krieger N. Comparing individual-and area-based socioeconomic measures for the surveillance of health disparities: a multilevel analysis of Massachusetts births, 1989–1991. Am J Epidemiol. 2006;164(9):823-34.

(15) Diez-Roux A, Kiefe CI, Jacobs DR, Haan M, Jackson SA, Nieto FJ, et al. Area characteristics and individual-level socioeconomic position indicators in three population-based epidemiologic studies. Ann Epidemiol. 2001;11(6):395-405.

(16) Geronimus AT, Bound J. Use of census-based aggregate variables to proxy for socioeconomic group: evidence from national samples. Am J Epidemiol. 1998;148(5):475-86.

(17) Rehkopf DH, Haughton LT, Chen JT, Waterman PD, Subramanian S, Krieger N. Monitoring socioeconomic disparities in death: comparing individual-level education and area-based socioeconomic measures. Am J Public Health. 2006;96(12):2135-8.

(18) Krieger N. Overcoming the absence of socioeconomic data in medical records: validation and application of a census-based methodology. Am J Public Health. 1992 May;82(5):703-10.

(19) Hastert TA, Beresford SA, Sheppard L, White E. Disparities in cancer incidence and mortality by area-level socioeconomic status: a multilevel analysis. J Epidemiol Community Health. 2015 Feb;69(2):168-76.

(20) Statistics Canada. [Internet]. Statistics Canada; NHS User Guide: National Household Survey, 2011 cited 21 November, 2017]; [about 23 screens]. Available from: http://www12.statcan.gc.ca/nhs-enm/2011/ref/nhs-enm_guide/99-001-x2011001-eng.pdf.

(21) Peters PA, Oliver LN, Carrière G. Geozones: An area-based method for analysis of health outcomes. Health Reports. 2012;23(1):1-10.

METHODOLOGY:
TECHNICAL NOTES

ACRONYM	FULL NAME
AB	Area-Based
AF	Attributable Fractions
AST_rate	Age-Standardized Indicator Rates
AST_var	Age-Standardized Variance
CBDB	Canadian Birth Database
CCHS	Canadian Community Health Survey
CCR	Canadian Cancer Registry
CA	Census Agglomeration
CI	Confidence Interval
CMA	Census Metropolitan Area
CMDB	Canadian Mortality Database
CSD	Canadian Survey on Disability
CTBRS	Canadian Tuberculosis Reporting System
CV	Coefficient of Variance
DA	Dissemination Area
EDI	Early Development Instrument
HALE	Health-Adjusted Life Expectancy
HMHDB	Hospital Mental Health Database
HUI	Health Utilities Index
HUI3	Health Utilities Index Mark 3
HUP	Health Utilities Index – Pain and Discomfort
ICD-O-3	International Classification of Diseases for Oncology, 3rd edition
IL	Individual-Level
IPPE	Income Per Person Equivalent
LICO	Low Income Cut Off
NHS	National Household Survey
PAF	Population Attributable Fraction
PAR	Population Attributable Rate
PCCF+	Postal Code Conversion File Plus
PIN	Population Impact Number
RD	Rate Difference
RHS	First Nations Regional Health Survey
RR	Rate Ratio
SD or STD	Standard Deviation
UCI	Upper Confidence Interval

Annex 1: Social Stratifiers used to Define Population/Social Groups

Data were derived from multiple surveys and administrative sources. Self-reported survey data from the Canadian Community Health Survey (CCHS), National Household Survey (NHS) and Canadian Survey on Disability (CSD) were the most complete. Administrative data such as the Canadian Mortality Database, the Hospital Mental Health Database, and the Canadian Cancer Registry did not have information on many of the stratifiers of interest such as individual-level income and education. However, because these databases contain individual-level information that include residence (postal code), missing stratifiers of interest, such as income and education, were derived based on geographical area. However, this was not possible for the tuberculosis indicator, for which residence was only available at the provincial/territorial level.

1. Individual-level Stratifiers

All stratifiers from survey data were at the individual level; specific stratifier availability depended on the survey: CCHS, CSD, and NHS.

- Income quintiles[8] – national: a relative measure of each respondent's household income compared with the household incomes of all other respondents. This stratifier is derived from the total before-tax household income adjusted for household size and community size for CCHS (1). For NHS (2) and CSD (3), this stratifier is derived from the total after-tax household income adjusted for household size.

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[8] An income quintile is a measure of neighbourhood socioeconomic status that divides the population into five income groups (from lowest income to highest income) so that approximately 20% of the population is in each group.

- Income quintiles – provincial: a distribution of the household income adequacy ranking for the residents of each of the 10 provinces. This stratifier provides, for each respondent, a measure of their household income relative to the household incomes of all other respondents in the same province. The territories are excluded. It is derived from the total before-tax household income adjusted for household size and community size for CCHS. This measure is not available for NHS and CSD.
- Indigenous identity: based on self-reported identity as:
    - First Nations (including Status and Non-Status Indians): Only First Nations living off reserve are included for CCHS indicators, Early Development Indicator (EDI) and the core housing need indicator from NHS, whereas First Nations living both on and off reserve are included for the working poor indicator from NHS as well as the disability indicator from CSD;
    - Métis;
    - Inuk/Inuit; or
    - non-Indigenous.

However, for CSD and EDI, there are only two categories (Indigenous and non-Indigenous) because of sample size issues. In addition, for selected indicators (see Methodology Table 1), comparable data from the First Nations Regional Health Survey (RHS) are available for First Nations living on reserve and in northern communities (based on band membership rather than self-reported identity) (see Methodology Box 1).

- Respondent education / household education: self-reported highest level of education acquired by the respondent[9] / acquired by any member of the household and classified as follows:
    - less than high school;
    - high school graduate;
    - community college/technical school/ university certificate;
    - some postsecondary; or
    - university graduate.
- Occupation: based on the National Occupation Classification for Statistics for 2006 and includes the following categories:
    - unskilled;
    - semi-skilled;
    - skilled/technical/supervisor;
    - managerial; or
    - professional.
- Employment status (ages 18–75 years): self-reported work status the previous week, employment status includes the following categories:
    - permanently unable to work (may include respondents who were retired);
    - did not have a job last week, did not look for work in the past 4 weeks;
    - did not have a job last week, looked for work in the past 4 weeks; or
    - had a job last week / had a job—absent from work last week.

However, for the disability indicator, there are only three categories (employed; unemployed; not in labour force) because of sample size issues.

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[9] Since some people may still be in high school at the age of 18 years but usually complete their high school by the age of 20 years, the education stratifier was restricted to respondents aged 20 years or older in order to better capture the education level of the respondents.

- Cultural/racial background: self-reported racial or cultural groups are:
    - White;
    - Black;
    - East/Southeast Asian (e.g. Chinese, Japanese, Korean, Filipino, etc.);
    - South Asian (e.g. East Indian, Pakistani, Sri Lankan, etc.);
    - Arab/West Asian (e.g., Iranian, Afghan, etc.);
    - Latin American; or
    - Other/multiple origins.
- Visible minority status: for cultural/racial background, there are only two categories (visible minority, non-visible minority) because of sample size issues to do with the CSD and the NHS.
- Immigrant status: based on respondent's response, respondents are classified as non-immigrant, recent immigrant (≤10 years), or long-term immigrant (>10 years).
- Sexual orientation (ages 18–59 years): based on self-reported response, respondents were classified as heterosexual, lesbian/gay, or bisexual.
- Rural/urban residence: based on the 2006 Census dissemination area and 2006 Census metropolitan area (CMA) the respondent lives in. There are five categories (4):
    - large CMAs (Montréal, Toronto, Vancouver);
    - other CMAs (large urban centres other than Toronto, Montréal, and Vancouver), consisting of one or more adjacent municipalities around a major urban core, with a population of at least 100 000 of which at least 50 000 live in the core;
    - Census agglomerations (small urban centres), consisting of one or more adjacent municipalities, with a population of at least 10 000;
    - strong or moderate Census metropolitan influenced zone (provincial rural areas), consisting of provincial Census sub-divisions with a population under 10 000 where at least 5% of the Census sub-division's resident employed labour force commute to work in any CMA or Census agglomerations; and
    - weak or no Census metropolitan influenced zone and territories (remote areas), consisting of territorial Census sub-divisions outside CMAs and Census agglomerations with a population under 10 000 AND provincial Census sub-divisions with a population under 10 000 where less than 5% of the Census sub-division's resident employed labour force commute to work in any CMA or Census agglomerations.
- Functional health: index based on a multi-attribute health status classification system for measuring generic health status and health-related quality of life. The version used by CCHS is the Health Utilities Index Mark 3 (HUI3). The HUI3 allows the calculation of a generic health status index based on attributes found in two different CCHS modules: Health Utilities Index – Pain and Discomfort (HUP) and the Health Utilities Index (HUI). The index used in our analysis can only be calculated when both HUP and HUI are collected in a given cycle. There are four categories: no functional impairment (index = 1.00); mild functional impairment (index = 0.89–0.99); moderate functional impairment (index = 0.70–0.88); and severe functional impairment (index ≤0.70).
- Participation and activity limitation: classifies respondents according to the frequency with which they experience activity limitations imposed on them by a condition(s) or by physical and/or mental health problems that have lasted or are expected to last 6 months or more. There are three categories: never limited, often limited, and sometimes limited.

- Tuberculosis: individuals diagnosed with active tuberculosis disease (new and re-treatment cases) only are recorded in the Canadian Tuberculosis Reporting System (CTBRS)(5). The CTBRS is a case-based surveillance system that maintains selected non-nominal data on people diagnosed with active tuberculosis disease including reporting province/territory, sex/gender, age at the time of reporting, and:
  - Indigenous identity: Canadian-born Indigenous people are defined as First Nations (on reserve and off reserve), Métis, or Inuit;
  - Origin: defined as Canadian-born Indigenous, Canadian-born non-Indigenous, and foreign-born.

2. Area-based Stratifiers

For indicators of mortality, life expectancy, vulnerability in early childhood development, and mental illness hospitalization, area-based stratifiers including income, education, immigrant status, Indigenous identity, rural/urban residence, and material and social deprivation index. These stratifiers are area-based measures derived at the dissemination area (DA) level based on the 2006 Census (6) . A dissemination area, with a population usually between 400 and 700, is the smallest relatively stable standard geographical area for which Census data are released (6). These area-based measures were linked to administrative health data records via postal codes using Statistics Canada's Postal Code$^{\text{OM}}$ Conversion File Plus (PCCF+)(7). These area-based measures of social stratifiers are defined below:

- Indigenous identity (First Nations/Inuit/Métis): A dissemination area is considered to have a high concentration of Indigenous residents when 33% or more of its population report their identity as Indigenous (8). The predominant Indigenous group may be First Nations, Inuit or Métis, reflecting the most common Indigenous identity reported among residents. Conversely, a dissemination area with a low concentration of Indigenous residents has less than 33% of its residents reporting an Indigenous identity.
- Immigrant status: The concentration of immigrants is the percentage of individuals in each dissemination area who were born outside of Canada. A dissemination area is considered to have a high concentration of immigrants when more than 51.8% of residents report being immigrants; a medium concentration of immigrants when between 27% and 51.8% of residents report being immigrants; and a low concentration of immigrants when 27% or less of the residents report being immigrants (9).
- Income: Quintile levels were derived at the dissemination area level and defined as a neighbourhood income per person equivalent (IPPE) adjusted for household size before tax. This variable is available in PCCF+. It is calculated based on person equivalents implied by the 2006 low income cut-offs (LICOs). The 2006 single person equivalents were 1.00 for 1 person, 1.24 for 2 persons, 1.53 for 3 persons, 1.94 for 4 or 5 persons, and 2.44 for 6 or more persons sharing the same household (regardless of age). Within each CMA or Census agglomeration (CMA/CA) or provincial residual area not in any CMA/CA, the dissemination area average IPPE was used to rank all DAs, and then the population was divided into approximate fifths, thus creating community-specific income quintiles based on IPPE. The quintiles were defined within each area in order to better reflect the relative nature of this measure, to minimize the effect on household welfare of large differences in housing costs, and to ensure that each CMA/CA would have about an equal percentage of the population in each income quintile. Where dissemination area income data were suppressed because of small sample size, imputations based on reported income from adjacent dissemination areas were substituted.

- Education[10]: Quintile levels were derived at the dissemination area level based on the percentage of people aged 20 years and older who had not graduated from high school. Quintile 1 has the lowest level of education, with 29.6% of residents aged 20+ years with less than a high school education. Quintile 5 has the highest level of education, with 10.2% or less of residents aged 20+ years with less than a high school education.
- Deprivation index: Three deprivation indices (material, social, and overall) were derived at the dissemination area level using information on education, employment, income, and living arrangements in various combinations to create quintiles on the level of deprivation (10,11). The following measures were used to reflect material deprivation:
  - the proportion of people aged 15 years and older with no high school diploma;
  - the employment/population ratio of people aged 15 years and older; and
  - the average income of people aged 15 years and older.
  - The following measures were used to reflect social deprivation:
  - the proportion of individuals aged 15 years and older living alone;
  - the proportion of individuals aged 15 years and older who are separated, divorced, or widowed; and
  - the proportion of single-parent families.

  A measure of overall deprivation was derived for those dissemination areas at the extreme end of deprivation for both material and social deprivation indices. The least deprived dissemination areas were categorized as Quintile 1 of material deprivation and Quintile 1 of social deprivation. The most deprived dissemination areas were categorized as Quintile 5 of material deprivation and Quintile 5 of social deprivation.

The social stratifiers used for each indicator and their categories are listed in Table 1 and described in detail in Appendix 1.

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[10] Since some people are still in high school at the age of 18 years but usually complete their high school at the age 20 years, the education stratifier was restricted to people aged 20 or older in order to better capture their education level.

Table 1. Social stratifiers used in this Report for Each Indicator

INDICATOR	STRATIFIERS
Life expectancy at birth (ecological level) Infant mortality weight ≥500 g Unintentional injury mortality Lung cancer incidence Intentional self-harm/suicide Mental illness hospitalization	Sex/gender Age group Education quintile (AB) Income quintile (AB) Indigenous identity (AB) Predominant Indigenous identity group Immigrant status (AB) Deprivation index quintile – material (AB) Deprivation index quintile – social (AB) Deprivation index – overall (AB) Rural/urban residence
Vulnerability in early child development	Sex/gender Indigenous identity Education quintile (AB) Income quintile – neighbourhood (AB) Immigrant status (AB) Deprivation index – overall (AB) Rural/urban residence
Health-adjusted life expectancy (HALE) – at age 18 years Food insecurity – household Perceived mental health – fair or poor Arthritis Asthma Diabetes, excluding gestational Obesity Alcohol use – heavy drinking Smoking Oral health – no ability to chew Exposure to second-hand smoke at home	Sex/gender Age group Income quintile – provincial (IL) Household education (IL) Respondent education (IL) Occupation (IL) Employment (IL) Indigenous identity (IL) Cultural/racial background (IL) Immigrant status (IL) Sexual orientation (IL) Functional health (IL) Participation and activity limitation (IL) Rural/urban residence
Disability	Sex/gender Income quintile – national (IL) Respondent education (IL) Occupation (IL) Employment (IL) Indigenous identity (IL) Immigrant status (IL) Rural/urban residence

INDICATOR	STRATIFIERS
Core housing need Working poor	Sex/gender Age group Income quintile – national (IL) Respondent education (IL) Employment (IL) Occupation (IL) Indigenous identity (IL) Immigrant status (IL) Cultural/racial background (IL) Visible minority status (IL) Rural/urban residence
Tuberculosis	Sex/gender Indigenous identity (IL) Origin (IL)

AB: area-based stratifier; IL: individual-level stratifier

Annex 2: Age-Standardization

Indicator rates (except for infant mortality and Early Development Instrument [EDI] indicators) were age standardized by the direct method of standardization, using the 2011 Canadian general population from the 2011 Census as the standard population. Age groupings used for age-standardization were adapted for specific data sources, indicators, and stratifiers (Appendix 2). Age-standardization for mortality, cancer incidence, and mental illness hospitalization was based on 5-year age groupings. For indicators from surveys, the age groupings depend on age range, sample size, indicators, and stratifiers. Detailed age groupings are shown in Table 2.

For survey data, weighted rates of each indicator for each domain of each social stratifier were calculated and variance estimates were derived through bootstrapping.

Table 2. Age groups used for Age-standardization According to Data Sources

DATA SOURCES	AGE RANGE OF INDICATOR AND STRATIFIER (YEARS)	AGE GROUPS FOR AGE-STANDARDIZATION
Canadian Community Health Survey (CCHS)	18+	18–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, 65–74, 75+
	18–75 (e.g. occupation, employment status)	18–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, 65–75
	18–59 (e.g. sexual orientation)	18–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59
	20+ (e.g. education of respondent)	20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50-54, 55–59, 60-64, 65–74, 75+
First Nations Regional Health Survey (RHS)	18+	18–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, 65–69, 70-74, 75-79, 80-84, 85+ (upper age groups may have been combined depending on the size of numerator)
Canadian Survey on Disability (CSD)	15+	15–24, 25–44, 45–64, 65–74, 75+
	20+ (e.g. education)	20–24, 25–44, 45–64, 65–74, 75+
	15–64 (e.g. occupation, employment status)	15–24, 25–44, 45–64
National Household Survey (NHS)	18–64 (Working Poor)	18–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64
	≥0 (Core housing need)	0–4, 5–6, 7–9, 10–11, 12–14, 15–17, 18–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, 65–69, 70–74, 75–79, 80-84,, 85+
Canadian Mortality Database (CMDB)	≥0	5-year age groups
Canadian Cancer Registry (CCR)	≥0	5-year age groups
Hospital Mental Health Database (HMHDB)	15+	5-year age groups

Annex 3: Measures of Inequalities and Their Calculations

All six measures are based on indicator rates. Age-standardized indicator rates (AST_rate) are used to calculate summary measures whenever the AST_rate is available; otherwise, crude rates are used (Table 3).

Table 3. Formulas for all Measures and their 95% Confidence Intervals

MEASURES		SURVEY DATA	ADMINISTRATIVE DATA
Crude rate	Point estimate	*Rate* (p) = number with outcome/total population of interest = x/n	
	95% CI	- Calculate *rate* with bootstrap weight (500 bootstrap weights are used); - Calculate variance (*rate_var*) of bootstrap weighted rates; - Calculate standard deviation of bootstrap weighted rates - *rate_SD* = $\sqrt{\frac{(500-1)*rate\_var}{500}}$ - Calculate the CV : *rate_CV* = *rate*_SD / *rate* - The 95% CI is given by: *rate* ± *1.96** $\sqrt{\frac{(500-1)*rate\_var}{500}}$	- *Rate_LCI* = $\frac{(2np+Z^2-1)-Z*\sqrt{(Z^2)-(2+\frac{1}{n})+4p(nq+1)}}{2(n+Z^2)}$ - *Rate_UCI* = $\frac{(2np+Z^2+1)+Z*\sqrt{(Z^2)+(2-\frac{1}{n})+4p(nq-1)}}{2(n+Z^2)}$ - (4) - *Rate_SE* = [(*rate* - LCI_*rate*)/1.96 + (UCI_*rate* – *rate*)/1.96]/2 (q=1-p; Z=1.96 for 95% CI)
AST-rate	Point estimate	W_i: the proportion of the total standard population for age group i AST_rate = ∑ (numerator/n_i)*W_i = ∑ (rate$_i$*W_i) (sum for all age groups)	
	95% CI	AST_var = $\sum(W_i^2 * rate\_var_i)$ AST_CV = $\sqrt{AST\_var}$ / *AST_rate* *The 95% CI is given by:* AST_rate ± *1.96** $\sqrt{AST\_var}$	AST_var = ∑ [(W$_i$/n$_i$)^2 * numerator$_i$] = ∑ (W$_i^2$ * rate$_i$/n$_i$) (sum for all age groups) 95% CI is given by: $e^{\log(AST_{rate}) \pm 1.96 * \sqrt{(\frac{1}{AST\_rate})^2 * AST\_var}}$ AST_SE = [(AST_rate_UCI – AST_rate)/1.96 + (AST_rate – AST_rate_LCI)/1.96] / 2 AST_CV = (AST_SE / AST_rate) *100

MEASURES		SURVEY DATA	ADMINISTRATIVE DATA
RR	Point estimate	$RR_i = R_i / R_0$ R_i : rate in the population group of interest i; R_0 : rate in the reference group; RR_i Rate ratio for the i-th group of interest relative to the reference group.	
	95% CI	- Calculate the RR_i with bootstrap weight (500 bootstrap weights are used) - Calculate variance of bootstrap weighted RR_i (VAR_RR_i) - Calculate standard deviation of bootstrap weighted RR with: - $STD\_RR_i = \sqrt{\frac{(500-1)*VAR\_RR_i}{500}}$ - The RR 95% CI is given by: $RR_i \pm 1.96 * STD\_RR_i$	(12-14) 1) $VAR(\log(RR_i)) = \frac{VAR\_R_i}{R_i^2} + \frac{VAR\_R_0}{R_0^2}$ 2) *The RR 95% CI is given by:* $e^{\log(RR_i) \pm 1.96 * \sqrt{VAR(\log(RR_i))}}$ $VAR(\log(RR_i))$: Variance of log(RR) VAR_R_i: Variance of rate for *i-th* population group VAR_R_0 Variance of rate for the reference group
RD	Point estimate	$RD_i = R_i - R_0$	

	95% CI	- Calculate RD_i with bootstrap weight (500 bootstrap weights are used)
		- Calculate variance of bootstrap weighted RD_i (VAR_RD_i)
		- Calculate standard deviation of bootstrap weighted RD_i
		  - $STD\_RD_i = \sqrt{\frac{(500-1)*VAR\_RD_i}{500}}$
		- The RD 95% CI is given by: $RD_i \pm 1.96 * STD\_RD_i$
			- (12)
			  - $VAR\_RD_i = VAR\_R_i + VAR\_R_0$
			  - *The RD 95% CI is given by:* $RD_i \pm 1.96 * \sqrt{VAR\_RD_i}$

AF%	Point estimate	$RD_i\% = ((R_i - R_0) / R_i)*100 = RD_i / R_i)*100$	
	95% CI	- Calculate $RD_i\%$ with bootstrap weight (500 bootstrap weights are used) - Calculate variance of bootstrap weighted $RD_i\%$ ($Var\_RD_i\%$) - Calculata standard deviation of bootstrap weighted $RD_i\%$ - $STD\_RD_i\% = \sqrt{\frac{(500-1)*Var\_RD_i\%}{500}}$ - The 95% CI of RD% is given by: $RD_i\% \pm 1.96 * STD\_RD_i\%$	*The 95% CI is given by:* $(RR\_LCI_i \pm 1)/RR\_LCI_i$

MEASURES		SURVEY DATA	ADMINISTRATIVE DATA
PAF (%)	Point estimate	$PAF_i = \frac{P_{ei}*(RR_i-1)}{RR_i}*100\%$ (14-16) P_{ei} is the proportion of total outcomes in the i-th subpopulation group PAF_i is the PAF for the i-th subpopulation group	
	95% CI	• Calculate PAF_i with bootstrap weight (500 bootstrap weights are used) • Calculate variance of bootstrap weighted PAF_i (PAF_i_var) • Calculate standard deviation of bootstrap weighted PAF_i /PPF$_i$: $PAF_i\_STD = \sqrt{\frac{(500-1)*PAF_i\_var}{500}}$ • The 95% CI is given by: $PAF_i \pm 1.96*PAF_i\_STD$	(16,17) $Var(\log(PAF_i)) = \frac{Var(\log(RR_i))}{(RR_i-1)^2} + \frac{B}{A*M} + \frac{2}{A*(RR_i-1)}$ If $0.21 < PAF_i < 0.79$, the 95% CI is given by: $\frac{1}{1+e^{-\left[\log\left(\frac{PAF_i}{1-PAF_i}\right) \pm \frac{1.96*\sqrt{var(\log(PAF_i))}}{1-PAF_i}\right]}}$ If $PAF_i < 0.21$ or $PAF_i > 0.79$, the 95% CI is given by : $PAF_i \pm 1.96*PAF_i*\sqrt{var(\log(PAF_i))}$ Where A: number of outcomes among the group of interest B: number of outcomes among reference group M=A+B $Var(\log(RR_i)) = \frac{Var\_R_1}{R_1^2} + \frac{Var\_R_2}{R_2^2}$
PAR	Point estimate	$PAR_i = P_1*PAF_i$ (18) P_1 : Proportion of outcome in the population	
	95% CI	• Calculate PAR_i with bootstrap weight (500 bootstrap weights are used) • Calculate variance of bootstrap weighted PAR_i (PAR_i_var) • Calculate standard deviation of bootstrap weighted PAR_i (PAR_i_STD) $PAR_i\_STD = \sqrt{\frac{(500-1)*PAR_i\_var}{500}}$ • The 95% CI is given by: $PAR_i \pm 1.96*PAR_i\_STD$	1) Calculating 97.5% CIs for P_1 using the method of calculating CI for rate: $P_1\_LCI_{97.5\%}$ and $P_1\_UCI_{97.5\%}$ 2) Calculating 97.5% CIs for PAF using the methods of calculating CI for PAF/PPF: $PAF_i\_LCI_{97.5\%}$ and $PAF_i\_UCI_{97.5\%}$ 3) The 95% CIs for PAR and P-PAR are given by (19): $PAR_i\_LCI = P_1\_LCI_{97.5\%} * PAF_i\_LCI_{97.5\%}$ $PAR_i\_UCI = P_1\_UCI_{97.5\%} * PAF_i\_UCI_{97.5\%}$
PIN	Point estimate	$PIN_i = N*P_1*PAF_i = N*PAR_i$ (20) N: number of people in the population	
	95% CI	1) Calculate PIN_i with bootstrap weight (500 bootstrap weights are used) 2) Calculate variance of bootstrap weighted PIN_i (PIN_i_var) 3) Calculate standard deviation of bootstrap weighted PIN_i (PIN_i_STD) • $PIN_i\_STD = \sqrt{\frac{(500-1)*PIN_i\_var}{500}}$ 4) The 95% CI is given by: $PIN_i \pm 1.96*PIN_i\_STD$	• $PIN_i\_LCI = N*PAR_i\_LCI$ $PIN_i\_UCI = N*PAR_i\_UCI$

CI: confidence interval; CV: coefficient of variance; AF: attributable fraction; AST_rate: age-standardized indicator rate; AST_SE : age-standardized standard error; AST_var: age-standardized variance; LCI: lower confidence interval; PAF: population attributable fraction; PAR: population attributable rate; PIN: population impact number; RD: rate difference; RR: rate ratio; SD/ STD: standard deviation;: UCI: upper confidence interval

Annex 4: Data Reportability (data suppression)

For the purpose of data confidentiality, the following rules for data reportability were applied to all analysis results.

Administrative data

For administrative data, the suppression rule has been applied by Statistics Canada and the Canadian Institute of Health Information as follows:

- Life expectancy and health-adjusted life expectancy (HALE; individual-level stratifiers linked to CCHS): if a subpopulation category has less than 80 deaths, the results for this category are suppressed.
- Indicators of mortality, cancer incidence, birth outcomes, and mental illness hospitalization: if the numerator for a subpopulation category is less than 5, the result for this category is suppressed. In addition, numerator and denominator estimates were randomly rounded to base 5 in accordance with Statistics Canada disclosure rules.
- Indicators for Early Development Instrument (EDI): suppression applies within a subpopulation category:
  - If the denominator is less than 5 or blank; and
  - If the numerator is 0.

Survey data

- If there are fewer than 10 observations in the numerator (for the First Nations Regional Health Survey, fewer than 5 observations in the numerator) or less than 20 in the denominator, all estimates are suppressed.
- The reportability of numerators, crude rates, and age-standardized rates are based on their coefficient of variance (CV) obtained via the bootstrapping technique:
  - If $0.0 \leq CV < 16.6$, the rate is reportable;
  - If $16.6 \leq CV \leq 33.3$, the estimate is reportable with caution, represented by the letter E;
  - If $CV > 33.3$, the estimate is not reportable, represented by the letter F.
- The reportability of summary measures is based on the reportability of the numerators and rates:
  1. Reportability of rate ratio (RR), rate difference (RD) and attribution fraction (AF%):
     - If the rates are reportable ($CV < 16.6$) for both the population subgroup and the reference, then RR, RD and AF% are reportable;
     - If the rates are reportable with caution (E) for either the population subgroup or the reference, then RR, RD and AF% are reportable with caution;
     - If the rate is unreportable ($CV > 33.3$ or F) for either the population subgroup or the reference, then RR, RD, AF% are unreportable;
     - For child data, the reportability of RR, RD and AF% is based on crude rates because age-standardization was not performed.

  2. Reportability of population attributable fraction (PAF), population attributable rate (PAR) and population impact number (PIN):
     - If the age-standardized numerators are reportable ($CV < 16.6$) for both the population subgroup and the reference, then PAF, PAR and PIN are reportable;
     - If the age-standardized numerators are reportable with caution (E) for either the population subgroup or the reference, then PAF, PAR and PIN are reportable with caution;
     - If the age-standardized numerators are not reportable ($CV > 33.3$ or F) for either the population subgroup or the reference, then PAF, PAR and PIN are not reportable;
     - For child data, the reportabilities of PAF, PAR, and PIN are based on crude numerators because age-standardization was not performed.

Annex 5: Calculating Individual Scores for Quantitative Ranking – Smoking

Table 4. Threshold Rank Progression for smoking, 18+

	RR			RD			TOTAL
POPULATION GROUPS	1ST THRESHOLD	2ND THRESHOLD	3RD THRESHOLD	1ST THRESHOLD	2ND THRESHOLD	3RD THRESHOLD	
Indigenous identity	1	1	1	1	1	1	6
Cultural/racial background	1	1	1	1	1	0	5
Sexual orientation	1	1	0	1	1	1	5
Functional health	1	1	0	1	1	1	5
Immigrant status	1	1	1	1	1	0	5
Income	1	1	0	1	1	0	4
Education	1	1	1	1	1	1	6
Employment status	1	1	0	1	1	1	5
Occupation	1	1	1	1	1	1	6
Rural/Urban residence	1	0	0	1	0	0	2
Total	**10**	**9**	**5**	**10**	**9**	**6**	**49**

Annex 6: Population Exclusions

Table 5. Populations and Exclusions for each Data Source

DATA SOURCE	SAMPLING	POPULATION EXCLUSIONS
Early Development Instrument (EDI)	Children in kindergarten, at school entry (year before grade 1), and have been in the same class for at least one month.	Alberta, Nova Scotia, Newfoundland and Labrador, and Nunavut were not included Children with special needs
Canadian Community Health Survey (CCHS)	People aged 12 years and over living in the 10 provinces and the 3 territories. In the north, the frame for the CCHS covers 92% of the targeted population in the Yukon, 96% in the Northwest Territories and 92% in Nunavut (from 2013). In Nunavut before 2013, the coverage was 71% because the survey covered only the 10 largest communities.	People living on reserves and other Indigenous settlements in the provinces Full-time members of the Canadian Armed Forces The institutionalized population Children aged 12–17 years who are living in foster care People living in the Quebec health regions of Nunavik and Terres-Cries-de-la-Baie James
First Nations Regional Health Survey (RHS 2008/10)	Adults aged 18 years and over and youth aged 12 to 17 years in 216 First Nations communities (on reserve and in northern Canada (above the 60th parallel).	James Bay Cree (Northern Quebec) Innu (Labrador) Communities with populations of less than 75 persons (approximately 11% of all communities)
National Household Survey (NHS)	All persons who usually live in Canada, in the provinces and the territories. It includes persons who live on Indian reserves and in other Indian settlements, permanent residents, non-permanent residents such as refugee claimants, holders of work or study permits, and members of their families living with them.	Representatives of a foreign government assigned to an embassy, high commission or other diplomatic mission in Canada Members of the armed forces of another country stationed in Canada Residents of another country who are visiting Canada temporarily People living in institutional collective dwellings such as hospitals, nursing homes, and penitentiaries Canadian citizens living in other countries including full-time members of the Canadian Armed Forces stationed outside Canada People living in non-institutional collective dwellings such as work camps, hotels and motels, and student residences People living in incompletely enumerated First Nations communities (**http://www12.statcan.gc.ca/nhs-enm/2011/ref/aboriginal-autochtones-eng.cfm**).
Canadian Survey on Disability (CSD)	Canadians aged 15 years and older living in private dwellings who reported an activity limitation on the 2011 NHS.	Individuals living in institutions and other collective dwellings People living on First Nations reserves
Vital Statistics – Canadian Mortality Database (CMDB)		Records with missing or invalid postal codes Missing information on sex/gender and/or age Records with no dissemination area assigned when processed through Statistics Canada's Postal Code Conversion File (PCCF+)

DATA SOURCE	SAMPLING	POPULATION EXCLUSIONS
Vital Statistics – Canadian Birth Database (CBDB)		Stillbirths Births in Ontario Births to Ontario residents that occurred outside of Ontario Birth in the USA Births with missing or invalid postal codes (dissemination area not assigned) Births with missing sex/gender information Records with no dissemination area assigned when processed through PCCF+
Canadian Cancer Registry (CCR)		Cancer records with missing International Classification of Diseases for Oncology (ICD-O-03) information Cancer records with missing or invalid postal code information Records with morphology codes M-9050 to M9055, M-9140, M-9590 to M-9992
Hospital Mental Health Database (HMHD)	Five selected mental illness conditions (combined): substance-related disorders; schizophrenia, delusional and non-organic psychotic disorders; mood/affective disorders; anxiety disorders; and selected disorders of adult personality and behaviour.	Population under 15 years of age General and psychiatric hospital inpatients whose postal code of residence is blank or invalid
Canadian Tuberculosis Reporting System	Individuals newly diagnosed with active tuberculosis disease (new and re-treatment cases) only.	

References

(1) Statistics Canada. Canadian Community Health Survey (CCHS) annual component, 2009-2010 common content Derived Variable (DV) specifications. Statistics Canada; 2011 .

(2) Statistics Canada. Income Reference Guide - National Household Survey. 2011.

(3) Statistics Canada. Canadian Survey on Disability, 2012: Concepts and methods guide. Statistics Canada; 2014 [cited 15 November, 2017].

(4) Statistics Canada. [Internet]. Statistics Canada; Illustrated Glossary, Census year 2011 Available from: http://www.statcan.gc.ca/pub/92-195-x/92-195-x2011001-eng.htm.

(5) Anonymous [Internet]. Government of Canada; Surveillance of tuberculosis (TB) [updated 2016 March 14, 2016; Available from: https://www.canada.ca/en/public-health/services/diseases/tuberculosis-tb/surveillance-tuberculosis-tb.html.

(6) Statistics Canada. 2006 Census Technical Report: Coverage. 2006 .

(7) Statistics Canada. Postal CodeOM Conversion File (PCCF), Reference Guide. 2017(Catalogue no. 92-154-G).

(8) Allard Y, Wilkins R, Berthelot J. Premature mortality in health regions with high Aboriginal populations. Health Reports. 2004;15(1).

(9) Carrière G, Peters PA, Sanmartin C. Area-based methods to calculate hospitalization rates for the foreign-born population in Canada, 2005/2006. Health reports. 2012;23(3):43-51.

(10) Pampalon R, Hamel D, Gamache P. A comparison of individual and area-based socio-economic data for monitoring social inequalities in health. Health Report. 2009 Dec;20(4):85.

(11) Townsend J. Deprivation. Journal of social policy. 1987;16(2):125-46.

(12) Rothman KJ, Greenland S, Lash TL editors. Modern epidemiology. : Lippincott Williams & Wilkins; 2008.

(13) Flanders WD. Approximate variance formulas for standardized rate ratios. J Chronic Dis. 1984;37(6):449-53.

(14) Harvard School of Public Health. [Internet]. The Public Health Disparities Geocoding Project Monograph [updated 2018 Available from: https://www.hsph.harvard.edu/thegeocodingproject/analytic-methods/.

(15) Rockhill B, Newman B, Weinberg C. Use and misuse of population attributable fractions. Am J Public Health. 1998 Jan;88(1):15-9.

(16) Greenland S. Variance estimators for attributable fraction estimates consistent in both large strata and sparse data. Stat Med. 1987;6(6):701-8.

(17) Gerstman B. Epidemiology Kept Simply: Introduction to Traditional and Modern Epidemiology. : SciELO Brasil; 2016.

(18) Hennekens CH, Buring JE, Mayrent SL. Epidemiology in medicine. : Boston: Little Brown and Company, 1987; 1987.

(19) Natarajan S, Lipsitz SR, Rimm E. A simple method of determining confidence intervals for population attributable risk from complex surveys. Stat Med. 2007;26(17):3229-39.

(20) Heller RF, Buchan I, Edwards R, Lyratzopoulos G, McElduff P, St Leger S. Communicating risks at the population level: application of population impact numbers. BMJ. 2003 Nov 15;327(7424):1162-5.

HEALTH OUTCOMES

LIFE EXPECTANCY AND MORTALITY

INEQUALITIES IN

LIFE EXPECTANCY AND HEALTH-ADJUSTED LIFE EXPECTANCY IN CANADA

INEQUALITIES HIGHLIGHTS

- Life expectancy, which focuses on length of life, is a key indicator of overall health status. Health-adjusted life expectancy, which is the average number of healthy years that a person would live, factors in health-related quality-of-life indicators.
- Compared with women, men on average have shorter lives and shorter health-adjusted life expectancy at age 18.
- Life expectancy at birth is lower in areas where there is a high concentration of people who identify as Indigenous: 12 years lower in areas with a high concentration of Inuit; 11.2 years lower in areas with a high concentration of First Nations; and 6.9 years lower in areas with a high concentration of Métis. If there were no inequalities between people living in areas with low concentrations of Indigenous groups and those living in areas with high concentrations of Inuit, First Nations people or Métis, there would be an increase of 17.2%, 15.9% and 9.2%, respectively, in the life expectancy of Canadians living in areas with high concentrations of Inuit, First Nations people or Métis.
- Canadians with less than a high school education live 11.3 fewer healthy years than university graduates. If Canadians with less than a high school education lived as many years in good health as university graduates, they would experience a 22.1% increase in their health-adjusted life expectancy at age 18.
- Canadians in the lowest income group live 11.3 fewer healthy years than those in the highest income groups. If Canadians in the lowest income group lived as many years in good health as those in the highest income groups, they would experience a 22.4% increase in their health-adjusted life expectancy at age 18.
- Canadians living in areas of both high social and high material deprivation have a life expectancy 5.9 years shorter than those living in areas with low social and material deprivation. If Canadians who live in areas of high social and high material deprivation had the same life expectancy as those who live in low social and material deprivation areas, the life expectancy of Canadians who live in low social and material deprivation areas would increase by 7.6%.
- At age 18, immigrants live 3.4 years longer in good health than non-immigrants.

ACRONYM	FULL NAME
CCHS	Canadian Community Health Survey
CI	Confidence Interval
HALE	Health-Adjusted Life Expectancy
OECD	Organisation for Economic Co-operation and Development

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Life expectancy is a key indicator of overall health status and is monitored worldwide as a measure of societal development. It is defined as the estimated number of years a person can expect to live if current death rates remain constant. Increasing life expectancy can be attributed to many social and technological developments, including improvements in living standards, advancements in medical technology and practice, and higher levels of educational attainment (1).

Life expectancy, however, focuses only on length of life and does not take into account quality of life (2). Health-adjusted life expectancy (HALE) is the average number of healthy years that a person would live after factoring in the mortality and morbidity rates prevailing at the time (3). HALE is a way to look at the overarching relationship of morbidity and mortality and how this burdens a particular population (4). For these reasons, life expectancy and HALE were both selected as indicators of key health inequalities in Canada. (For more detailed information on how indicators were selected, see the Methodology chapter.)

Social determinants of health, such as income, education, occupation, and race, as well as unhealthy behaviours, such as cigarette smoking, poor diet, and lack of exercise, negatively impact life expectancy and HALE (5,6). Canadians living in poorer neighbourhoods are much more likely to have shorter HALE than those living in higher-income neighbourhoods (3). Canadians who have attained a higher level of education also live longer lives and do so in better health (2). Compared with women, men have shorter life expectancy and HALE, and experience greater socioeconomic disparities in life expectancy. However, women live a greater proportion of their life in poor health (7).

METHODS

Data from the Canadian Mortality Database (2009–2011) were used to estimate life expectancy at birth. Data from the Canadian Community Health Survey (CCHS) (2000/01 to 2007/08) that were linked to the Canadian Mortality Database (2000–2011) were used to derive HALE at age 18 years.

HALE at age 18 was estimated by adjusting life-years lived in each age interval by the weighting factor, which was derived from the Health Utilities Index (HUI) Mark 3 instrument. (For more information about the HUI, see the Methodology chapter). There are various ways to calculate HALE. We applied an incidence-based method that used a multistate life table to describe transition probabilities between health states (3).

Inequalities in area-based life expectancy at birth and individual-based HALE at age 18[11] were assessed by age and sex/gender and by six area-based social stratifiers: Indigenous identity (for HALE only), immigrant status, income, education, material and social deprivation, and urban/rural residence. Material and social deprivation indices were based on the proportion of people without a high school diploma; the proportion of the population employed and average personal income; the proportion of the population living alone; the proportion separated, divorced, or widowed; and the proportion of single-parent families (8).

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[11] HALE data from the Canadian Community Health Survey (CCHS) were only available for Canadians aged 12 years and older. For this analysis, HALE at 18+ years was chosen to reflect HALE among adults.

> Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported along with the corresponding 95% confidence intervals (CI). Statistical significance was assessed using 95% confidence intervals (9). Sex/gender-specific inequalities for the area-based measures were reported only if the differences between men and women were statistically significant. Two inequality measures were calculated to assess the size and impact of inequalities: estimate difference (years) and estimate difference per cent (%).

This report provides a baseline for the ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in the Canadian context. (For more detailed information, see the Methodology chapter.)

FINDINGS

Overall life expectancy at birth (2009–2011) was 81.8 years (Annex 1), whereas overall HALE at age 18 (2001–2011) was 56.8 years (Annex 2). There were significant inequalities in both indicators by all social groups. (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Sex/Gender

Canadian men had a shorter life expectancy at birth than women, living on average 4.5 less years. The life expectancy at birth for men was 79.5 (95% CI: 79.5–79.6) years and for women was 84.0 (95% CI: 83.9–84.0) years (Annex 1). If men lived as long as women, they would experience a 5.4% increase in their life expectancy.

This gap was narrower for HALE at age 18: men lived 3.3 less years in good health than women. HALE at age 18 was 55.1 (95% CI: 54.8–55.4) years for men and 58.4 (95% CI: 58.1–58.7) years for women. If men lived as many years in good health as women, they would experience a 5.7% increase in HALE at age 18.

Indigenous Peoples

Compared with those living in areas with a low concentration of Indigenous people, life expectancy at birth was lower by 12 years in areas with a high concentration of Inuit, at 69.7 (95% CI: 68.8–70.7) years. Life expectancy at birth was lower by 11.2 years in areas with a high concentration of First Nations, at 70.5 (95% CI: 70.2–70.8) years. In areas with a high concentration of Métis, life expectancy at birth was lower by 6.9 years, at 74.8 (95% CI: 74.1–75.5) years.

The magnitude of inequalities in life expectancies was greater among males than females (Figure 1).

If there were no inequalities between people living in areas with low concentrations of Indigenous groups and those living in areas with high concentrations of Inuit, First Nations people or Métis, there would be an increase of 17.2%, 15.9% and 9.2%, respectively, in the life expectancy of Canadians living in areas with high concentrations of Inuit, First Nations people or Métis.

Immigrant Status

People living in areas with a high concentration of Canadian-born residents had a life expectancy of 81.0 (95% CI: 81.0–81.1) years. This was 2.9 years lower than in areas with a high concentration of foreign-born residents, at 83.9 (95% CI: 83.8–84.0) years (Figure 2).

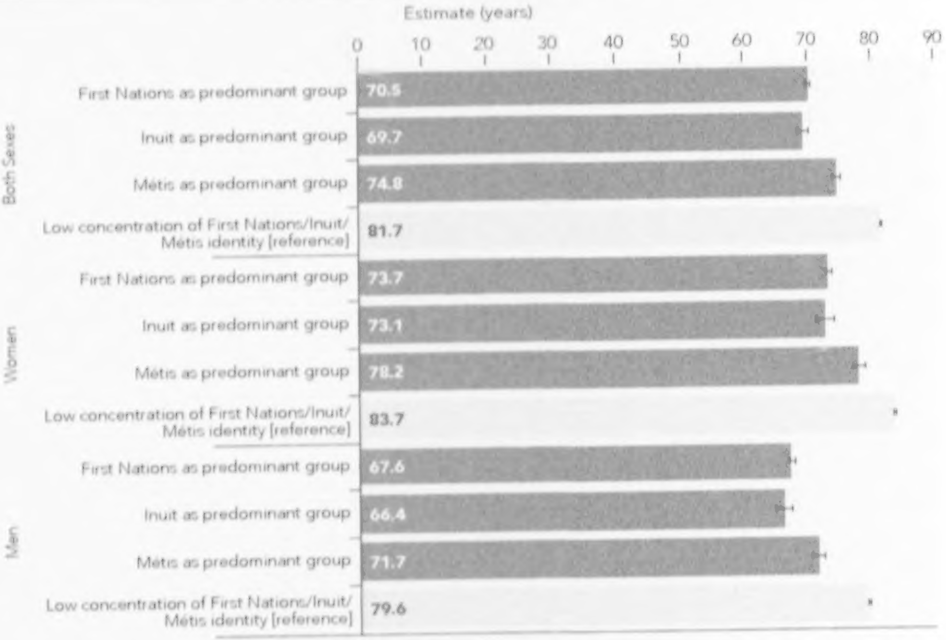
HALE at age 18 showed a similar pattern, with immigrants living 3.4 years longer in good health than non-immigrants. Sex differences in inequalities were also evident. Immigrant men lived an additional 4.2 years in good health compared with non-immigrant men. Immigrant women, on the other hand, lived an additional 2.6 years of life in good health compared with non-immigrant women (Figure 3).

Income

Canadians living in the lowest-income neighbourhoods had a life expectancy at birth of 79.1 (95% CI: 79.0–79.2) years. This was 4.1 years lower than those living in the highest-income neighbourhoods, whose life expectancy at birth was 83.2 (95% CI: 83.2–83.3) years. If those living in the lowest-income neighbourhoods had the same longevity as those living in the highest-income neighbourhoods, their life expectancy would increase by 5.2%. Comparisons of life expectancy at birth by sex/gender across income quintiles showed that men in the highest income quintile had a life expectancy 5.3 years higher than that of men in the lowest income quintile, while women in the highest income quintile had a life expectancy 3.1 years higher than that of women in the lowest income quintile (Figure 4).

FIGURE 1

Life Expectancy at Birth by Indigenous Identity and Sex/Gender, Canada, 2009–2011

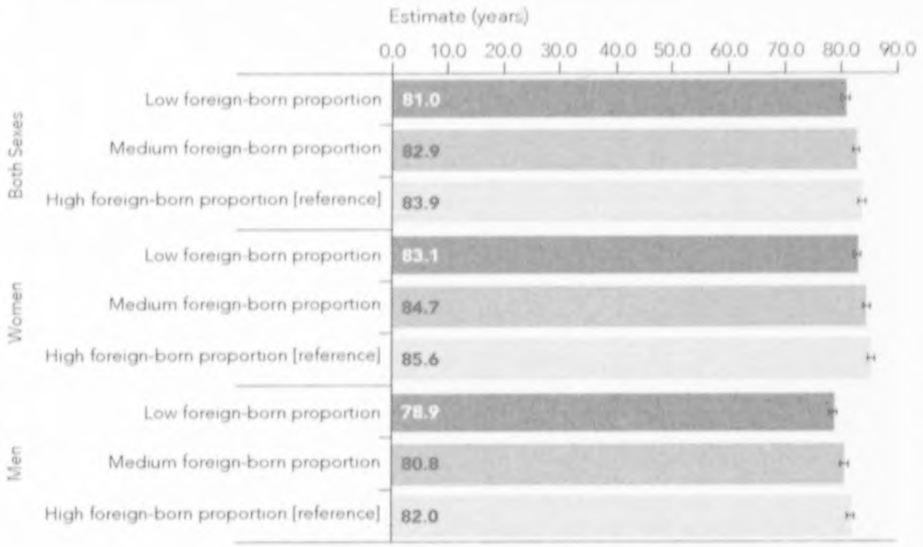


BOTH SEXES	ESTIMATE DIFFERENCE (YEARS)	ESTIMATE DIFFERENCE (%)
First Nations as predominant group	−11.2*	−15.9
Inuit as predominant group	−12.0*	−17.2
Métis as predominant group	−6.9*	−9.2
Low concentration of First Nations/Inuit/Métis identity [reference]	0.0	0.0
WOMEN		
First Nations as predominant group	−10.0*	−13.6
Inuit as predominant group	−10.6*	−14.5
Métis as predominant group	−5.5*	−7.0
Low concentration of First Nations/Inuit/Métis identity [reference]	0.0	0.0
MEN		
First Nations as predominant group	−12.0*	−17.8
Inuit as predominant group	−13.2*	−19.9
Métis as predominant group	−7.9*	−11.0
Low concentration of First Nations/Inuit/Métis identity [reference]	0.0	0.0

*: Significantly different from reference category
Area-level measures of Indigenous identity derived from the 2006 Census of Population
Ecological stratification for life expectancy data was derived using the 2006 Census of Population
Predominant group: ≥ 33% of residents in dissemination area report Indigenous identity with majority belonging to indicated group
Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

FIGURE 2

Life Expectancy at Birth by Immigrant Status and Sex/Gender, Canada, 2009–2011

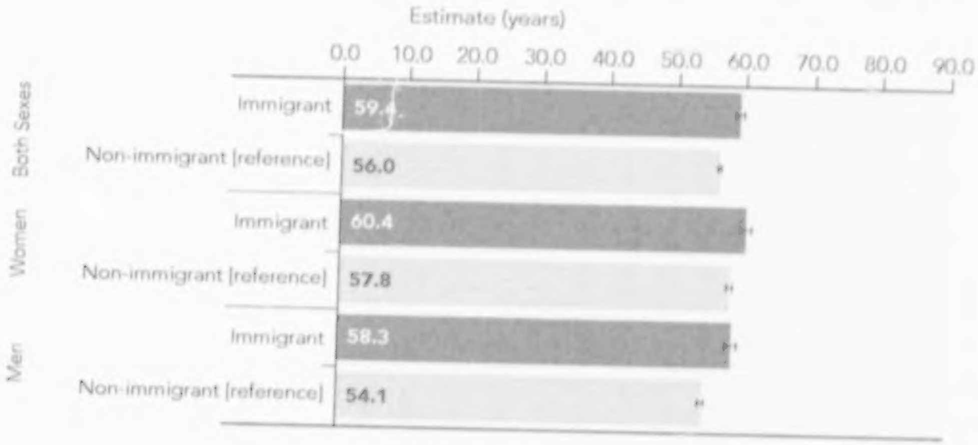


BOTH SEXES	ESTIMATE DIFFERENCE (YEARS)	ESTIMATE DIFFERENCE (%)
Low foreign-born proportion	−2.9*	−3.6
Medium foreign-born proportion	−1.0*	−1.2
High foreign-born proportion [reference]	0.0	0.0
WOMEN		
Low foreign-born proportion	−2.5*	−3.0
Medium foreign-born proportion	−0.9*	−1.1
High foreign-born proportion [reference]	0.0	0.0
MEN		
Low foreign-born proportion	−3.1*	−3.9
Medium foreign-born proportion	−1.2*	−1.5
High foreign-born proportion [reference]	0.0	0.0

*: Significantly different from reference group
Area-level measures of immigrant status derived from the 2006 Census of Population
Ecological stratification for life expectancy data was derived using the 2006 Census of Population
Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

FIGURE 3

Health-Adjusted Life Expectancy at Age 18 by Immigrant Status and Sex/Gender, Canada, 2000–2011



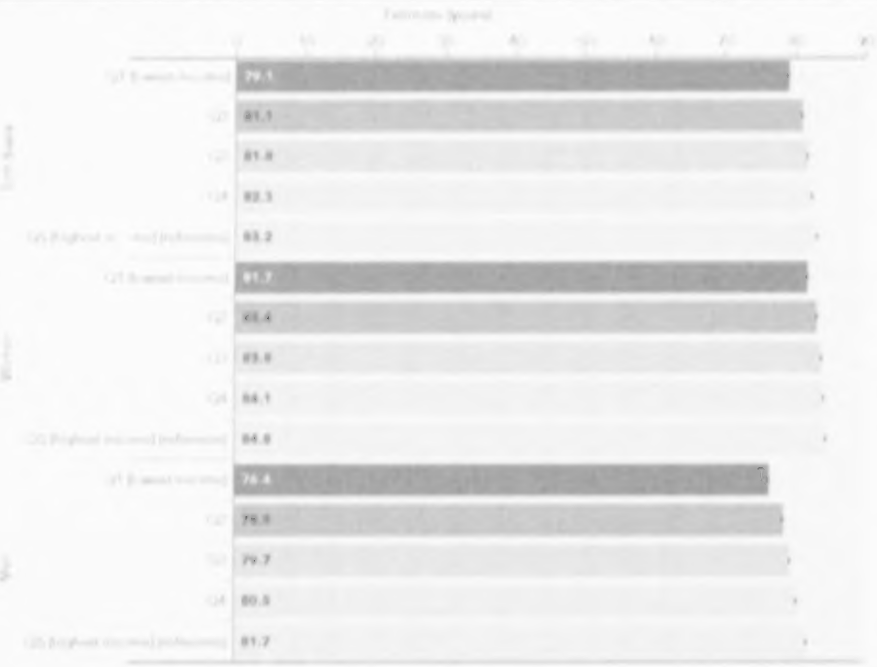
BOTH SEXES	ESTIMATE DIFFERENCE (YEARS)	ESTIMATE DIFFERENCE (%)
Immigrant	3.4*	5.6
Non-immigrant [reference]	0.0	0.0
WOMEN		
Immigrant	2.6*	4.3
Non-immigrant [reference]	0.0	0.0
MEN		
Immigrant	4.2*	7.2
Non-immigrant [reference]	0.0	0.0

*: Significantly different from reference group

Source: Canadian Community Health Survey (CCHS)–Annual Component (2000/01–2007/08) linked to Vital Statistics – Canadian Mortality Database (CMDB) 2000–2011

FIGURE 4

Life Expectancy at Birth by Income Quintile and Sex/Gender, Canada, 2009–2011



BOTH SEXES	ESTIMATE DIFFERENCE (YEARS)	ESTIMATE DIFFERENCE (%)
Q1 (lowest income)	−4.1*	−5.2
Q2	−2.1*	−2.6
Q3	−1.4*	−1.7
Q4	−0.9*	−1.1
Q5 (highest income) [reference]	0.0	0.0
WOMEN		
Q1 (lowest income)	−3.1*	−3.6
Q2	−1.4*	−1.7
Q3	−1.0*	−1.2
Q4	−0.7*	−0.8
Q5 (highest income) [reference]	0.0	0.0
MEN		
Q1 (lowest income)	−5.3*	−6.9
Q2	−2.9*	−3.7
Q3	−2.0*	−2.5
Q4	−1.2*	−1.5
Q5 (highest income) [reference]	0.0	0.0

Q: Quintile
*: Significantly different from reference group
Area-level measures of income quintiles derived from the 2006 Census of Population
Ecological stratification for life expectancy data was derived using the 2006 Census of Population
Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

Income inequalities in life expectancy were greater when taking into account years lived in good health. There was a clear positive gradient between income and HALE at age 18, with HALE increasing with increasing income. Canadians in the lowest income quintile lived 11.3 less years in good health than those in the highest income quintile. If Canadians in the lowest income quintile had the same life expectancy in good health as those in the highest income quintile, there would be an increase of 22.4% in the number of years lived in good health among Canadians with the lowest incomes (Figure 5).

If Canadians in the lowest income quintile lived in good health for the same number of years as those in the highest income quintile, there would be an increase of 22.4% in the number of years lived in good health among the poorest Canadians.

Men showed greater differences in life expectancy in good health according to income quintiles. Men living in the lowest income quintiles had a 12.9-year reduction in HALE at age 18 compared with those living in the highest income quintiles. In women, the difference between the lowest and highest income quintiles was estimated at 10.8 years (Figure 5).

Education

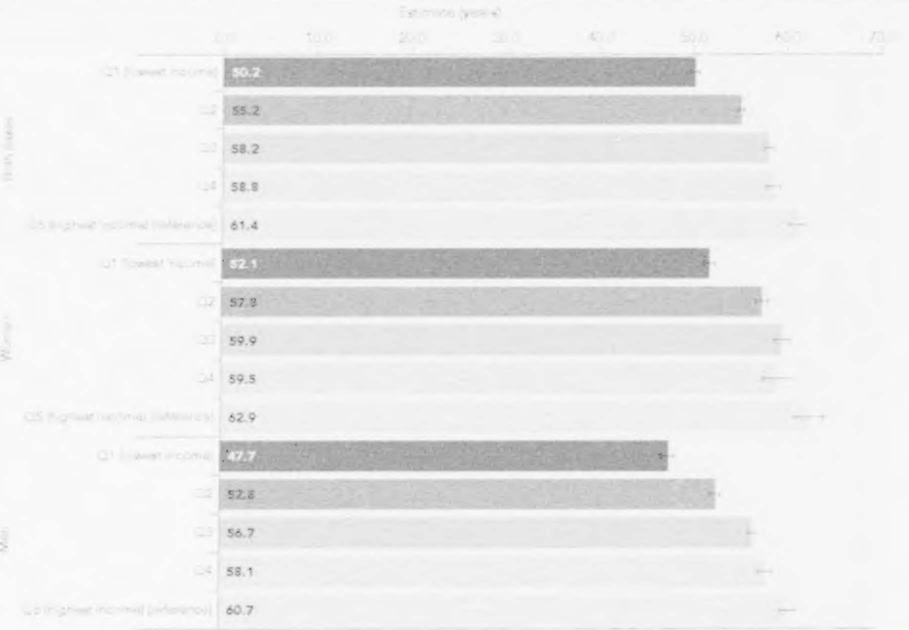
Canadians living in areas with the highest proportion of people with less than a high school education had a life expectancy of 79.9 (95% CI: 79.8–80.0) years. This is 3.1 years less than the life expectancy of those living in areas with the highest proportion of university-educated people, where life expectancy was 83.0 (95% CI: 83.0–83.1) years. If there were no inequalities between people living in areas with the lowest education and those living in areas with the highest education, there would be an increase of 3.9% in the life expectancy of Canadians living in the areas with the lowest education (Figure 6).

Men living in neighbourhoods with the highest educational levels had a life expectancy 3.7 years higher than that of men living in neighbourhoods with the lowest educational levels. For women, the corresponding difference was 2.3 years (Figure 6).

Again, inequalities in HALE were larger than inequalities found for life expectancy. For HALE at age 18, the difference between Canadians with a university education and those who had not completed high school was 11.3 years. If HALE at age 18 for Canadians who had not completed high school was the same as for university graduates, there would be a 22.1% increase in the number of years lived in good health at age 18 among Canadians who had not completed high school. Relative inequalities in HALE were slightly higher in men than in women. Men who had not completed high school had a reduction in HALE at age 18 of 12.3 years compared with men with a university education. For women, the corresponding reduction was 11.3 years (Figure 7).

FIGURE 5

Health-Adjusted Life Expectancy at Age 18 by Income Quintile and Sex/Gender, Canada, 2000–2011

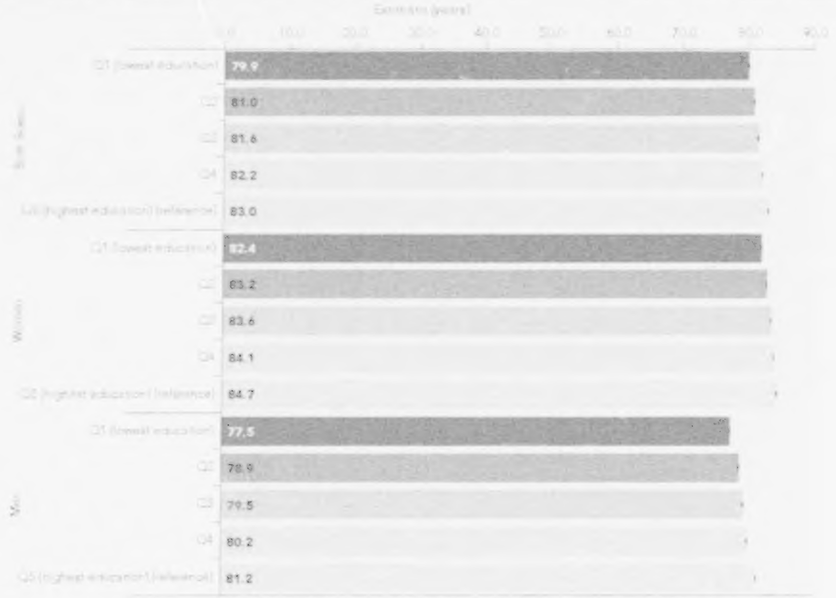


BOTH SEXES	ESTIMATE DIFFERENCE (YEARS)	ESTIMATE DIFFERENCE (%)
Q1 (lowest income)	−11.3*	−22.4
Q2	−6.2*	−11.2
Q3	−3.3*	−5.6
Q4	−2.6*	−4.5
Q5 (highest income) [reference]	0.0	0.0
WOMEN		
Q1 (lowest income)	−10.8*	−20.7
Q2	−5.1*	−8.8
Q3	−2.9*	−4.9
Q4	−3.3*	−5.6
Q5 (highest income) [reference]	0.0	0.0
MEN		
Q1 (lowest income)	−12.9*	−27.1
Q2	−7.9*	−15.0
Q3	−3.9*	−6.9
Q4	−2.6*	−4.5
Q5 (highest income) [reference]	0.0	0.0

Q: Quintile
* Significantly different from reference category
Source: Canadian Community Health Survey (CCHS)- Annual Component (2000/01-2007/08) linked to Vital Statistics – Canadian Mortality Database (CMDB) 2000-2011

FIGURE 6

Life Expectancy at Birth by Education Quintile and Sex/Gender, Canada, 2009–2011



BOTH SEXES	ESTIMATE DIFFERENCE (YEARS)	ESTIMATE DIFFERENCE (%)
Q1 (lowest education)	−3.1*	−3.9
Q2	−2.0*	−2.5
Q3	−1.4*	−1.7
Q4	−0.8*	−1.0
Q5 (highest education) [reference]	0.0	0.0
WOMEN		
Q1 (lowest education)	−2.3*	−2.8
Q2	−1.5*	−1.8
Q3	−1.1*	−1.3
Q4	−0.6*	−0.7
Q5 (highest education) [reference]	0.0	0.0
MEN		
Q1 (lowest education)	−3.7*	−4.8
Q2	−2.3*	−2.9
Q3	−1.7*	−2.1
Q4	−1.0*	−1.2
Q5 (highest education) [reference]	0.0	0.0

Q: Quintile

*: Significantly different from reference group

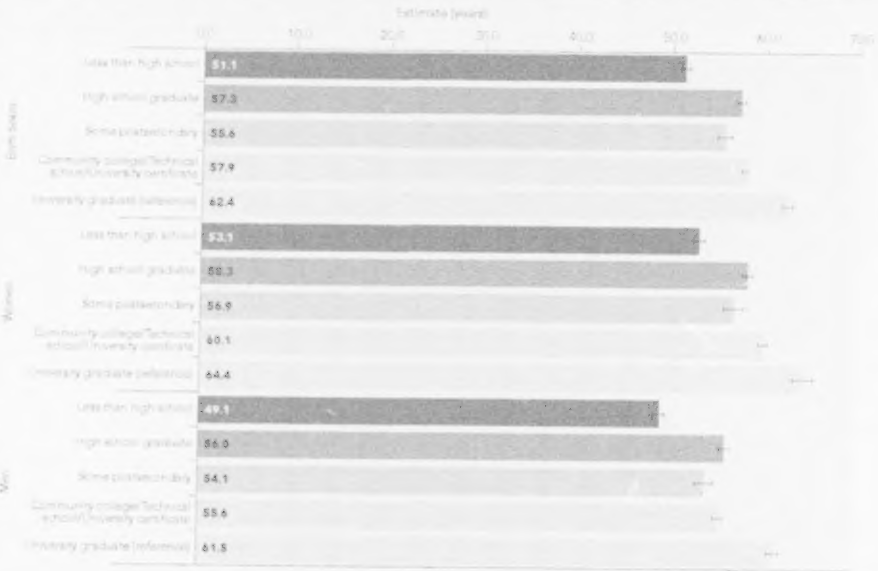
Area level measures of education quintiles derived from the 2006 Census of Population

Ecological stratification for life expectancy data was derived using the 2006 Census of Population

Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

FIGURE 7

Health-Adjusted Life Expectancy at Age 18 by Education Level and Sex/Gender, Canada, 2000–2011



BOTH SEXES	ESTIMATE DIFFERENCE (YEARS)	ESTIMATE DIFFERENCE (%)
Less than high school	−11.3*	−22.1
High school graduate	−5.1*	−8.9
Some postsecondary	−6.9*	−12.3
Community college/Technical school/ University certificate	−4.6*	−7.9
University graduate [reference]	0.0	0.0
WOMEN		
Less than high school	−11.3*	−21.3
High school graduate	−6.1*	−10.5
Some postsecondary	−7.4*	−13.1
Community college/Technical school/ University certificate	−4.3*	−7.1
University graduate [reference]	0.0	0.0
MEN		
Less than high school	−12.3*	−25.1
High school graduate	−5.4*	−9.7
Some postsecondary	−7.4*	−13.7
Community college/Technical school/ University certificate	−5.9*	−10.6
University graduate [reference]	0.0	0.0

* Significantly different from reference category

Source: Canadian Community Health Survey (CCHS)-Annual Component (2000/01–2007/08) linked to Vital Statistics – Canadian Mortality Database (CMDB) 2000–2011

Material and Social Deprivation

Life expectancy of Canadians living in areas with the most material deprivation[12] was 3.8 years lower than that of residents in the least materially deprived areas. The difference in life expectancy between those living in the most and the least socially deprived areas was 2.8 years. When both material and social deprivation were combined, people living in the most deprived areas had a life expectancy of 77.8 (95% CI: 77.7–78.0) years whereas those living in the least deprived areas had a life expectancy of 83.7 (95% CI: 83.6–83.9) years, a difference of 5.9 years. These inequalities were more pronounced among men than among women (Figure 8).

If Canadians who live in areas of high social and high material deprivation had the same life expectancy as those who live in low social and material deprivation areas, the life expectancy of Canadians who live in low social and material deprivation areas would increase by 7.6%.

Information on HALE at age 18 was not available by material and social deprivation.

Rural/Urban Residence

Canadians living in the three largest metropolitan areas (Toronto, Montréal, and Vancouver)[13] had a life expectancy of 83.0 (95% CI: 82.9–83.0) years, which was 1.5 years higher than Canadians living in other large cities (81.5 years; 95% CI: 81.5–81.6). Canadians living in remote areas, on the other hand, had a life expectancy 3.7 years lower than Canadians living in large cities other than Toronto, Montréal, and Vancouver (77.8 years; 95% CI: 77.7–77.8).

The difference between Canadians living in the largest urban areas and those living in other large urban areas was similar when looking at life expectancy in good health at age 18. Canadians living in Toronto, Montréal, and Vancouver lived, on average, 1.7 more years in good health at age 18 than those living in other large urban centres (Annex 2).

DATA GAPS / LIMITATIONS

Life expectancy at birth was used instead of life expectancy at age 18 to facilitate international comparisons. HALE at birth was not available as the CCHS covers only Canadians aged 12 years and older. It was not possible to make direct comparisons between life expectancy and HALE as these indicators do not cover the same age range.

Small numbers precluded calculation of some inequality results. For example, HALE could not be calculated for all cultural/racial groups. In addition, for the CCHS, limitations related to coverage for all provinces and territories, and the exclusion of key populations such as residents of long-term care facilities, need to be considered when interpreting HALE results.

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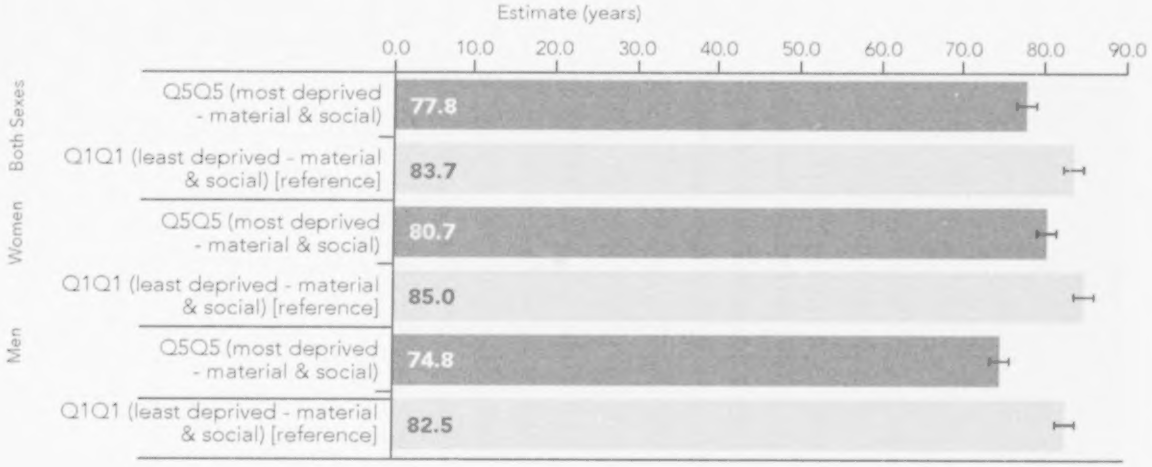
12. For a definition of the deprivation index, see the Methodology chapter.

13. For a definition of rural/urban subgroups, see the Methodology chapter.

FIGURE 8

Life Expectancy at Birth by Material and Social Deprivation Index, and Sex/Gender, Canada, 2009–2011



BOTH SEXES	ESTIMATE DIFFERENCE (YEARS)	ESTIMATE DIFFERENCE (%)
Q5Q5 (most deprived)	−5.9*	−7.6
Q1Q1 (least deprived) [reference]	0.0	0.0
WOMEN		
Q5Q5 (most deprived)	−4.3*	−5.3
Q1Q1 (least deprived) [reference]	0.0	0.0
MEN		
Q5Q5 (most deprived)	−7.7*	−10.3
Q1Q1 (least deprived) [reference]	0.0	0.0

Q: Quintile
*: Significantly different from reference group
Area-level measures of deprivation index derived from the 2006 Census of Population
Ecological stratification for life expectancy data was derived using the 2006 Census of Population
Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

Life expectancy was stratified according to area-based measures for education, immigrant status, and Indigenous identity, whereas HALE at age 18 was based on individual measures for those stratifiers. Using area-based measures as a proxy for individual data may lead to an underestimation of the inequalities associated with socioeconomic stratifiers. It also means that many variables of interest are not available. For example, large differences in life expectancy have been observed in the United States according to race; similar data by race/ethnicity are limited for Canada.

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (9), calculating *p*-values would confirm statistically significant differences.

The data are cross-sectional and highlight the distribution of health across different population groups in Canada. They capture the depth and impact of inequalities in life expectancy on different socially stratified groups. The disproportionate burden of shorter life expectancy and poorer quality of life experienced by these groups is driven by a complex system of social and structural drivers of health, which have yet to be fully explored and understood. The inequalities facing individuals and communities with multiple and intersecting identities are also not captured; nor do the data capture the heterogeneous nature of some social groups. For example, life expectancy varies significantly between immigrant populations from different source countries. Comparing the immigrant population as a whole to the non-immigrant population does not capture the nuances of inequality within and between different immigrant populations; this can lead to an over- or underestimation of the health burden facing these groups (10).

DISCUSSION

There have been growing concerns about increasing inequalities in morbidity and mortality across populations in many industrialized countries. In 2015, Canadian men ranked eighth among OECD member countries for life expectancy at birth (80.2 years) and Canadian women ranked tenth (84.1 years) (11). In the same year, Canada ranked tenth internationally for HALE at birth, at 72.3 years (12).

The life expectancy and HALE inequalities between socioeconomic groups in Canada are consistent with those observed in other developed countries. In Scotland, the gap in HALE between people living in the most and least deprived areas was 10.7 years, with the gap wider for men than women (13). In the United States, the difference in life expectancy between males and females was much greater among those whose income was in the lowest 1% than among those in the top 1%: 6.0 (95% CI: 5.9–6.2) years for males versus 1.5 (95% CI: 1.3–1.8) years for females (5). Moreover, the gap in life expectancy due to race and education was considerable: White, university-educated men had life expectancies 14.2 years higher than those of Black men without a high school education; and White, university-educated women had life expectancies 10.3 years higher than those of Black women without a high school education (14).

Although life expectancy and HALE have continued to increase in Canada, these improvements are not equally shared across all populations (3), with significant inequalities occurring across socioeconomic groups. It is estimated that 22% of premature years of life lost among Canadians could be attributed to income differences (15).

Canadian women lived, on average, 4.5 more years than men and 3.3 more healthy years than men. This finding is consistent with data from the Canadian Census mortality follow-up study, which found that Canadian women had both longer total life expectancy at birth and longer HALE than men in 2001 (3).

Wide gaps in life expectancy were observed between Indigenous and non-Indigenous Canadians. Compared with those living in areas with a low concentration of self-identified Indigenous people, life expectancy at birth was 12 years lower in areas with a high concentration of Inuit (males 66.4 years, females 73.1 years);

11.2 years lower in areas with a high concentration of First Nations peoples (males 67.6 years, females 73.7 years); and 6.9 years lower in areas with a high concentration of Métis (males 71.7 years, females 78.2 years). This is similar to previously reported projected life expectancies for the year 2017 for Indigenous people as well as for Canadians as a whole. In these reports, Métis and First Nations populations were projected to have life expectancies of 73 to 74 years for men and 78 to 80 years for women compared with 79 years for men and 83 years for women in the general population. Inuit were projected to have the lowest life expectancy, at 64 years for men and 73 years for women (16). These projections are comparable to life expectancies observed in some developing countries (for example, Guatemala, where life expectancy was 71.1 years in 2010) (17).

Inequalities in life expectancy at birth between Canadians living in the highest and lowest income quintiles were 5.3 years among men and 3.1 years among women, whereas inequalities in life expectancy at birth between Canadians living in the highest and lowest education quintiles were 3.7 years among men and 2.3 years among women. A 2002 Canadian report found that the interquartile disparity in life expectancy by neighbourhood income was 5 years for men and 2 years for women (18). A negative, stepped gradient in life expectancy at birth was also observed for both men and women. Also, consistent with previous research, inequalities in HALE for the best-off and worst-off socioeconomic groups by income and education were higher than inequalities in overall life expectancies (11 years for both variables) (3).

Material, social, and total deprivation measures were all associated with lower life expectancies. Life expectancy among Canadians living in areas with the most material deprivation was 3.8 years lower than for those in the least materially deprived areas, whereas life expectancy among those living in areas with the most social deprivation was 2.8 years lower than for those in the least socially deprived areas. This is similar to findings from the Census mortality follow-up study (1991–2001), which found that the difference in life expectancy at age 25 between the most and the least advantaged group was 3.5 years for *material* deprivation and 2 years for social deprivation (8).

Although Canada has one of the highest life expectancies in the world, it is not equally distributed across populations. There is a clear socioeconomic gradient, with both life expectancy and HALE increasing as neighbourhood incomes and education levels increase and as social and material deprivation decreases. Across all social stratifiers, men have lower life expectancies, as do Canadians living in areas with a high concentration of Indigenous people. Meanwhile, foreign-born Canadians enjoy greater HALE than non-immigrants. While risk factors around individual behaviours such as smoking, poor diet, and lack of exercise have a negative impact, broader social and environmental conditions greatly affect life expectancy and HALE (5,6). Fully addressing these inequalities will require policy interventions that address broader influences such as socioeconomic status, neighbourhood characteristics, and social and material deprivation. Systematic monitoring of health inequalities in life expectancy and HALE across sociodemographic and socioeconomic groups is needed to inform and strengthen interventions, programs, policies, and research to address individual-level and broader determinants. Ongoing measurement and monitoring can also reveal any changes in life expectancy and HALE or its determinants over time.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Life Expectancy at Birth. Data Source: CMDB 2009-2011

SUMMARY MEASURES

Social Stratifiers		Estimate			Estimate Difference (ED)			Estimate Difference Percent (ED%)		
		Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males
Overall	Both Sexes	81.8	84.0	79.5				NA		
Population Groups										
Sex/gender	Female	84.0	NA		NA	4.5*	NA	NA	5.4	NA
	Male [reference]	79.5			Reference					
Indigenous indentity (area-based measure)	High concentration of Indigenous identity groups	71.2	74.5	68.2	-10.5*	-9.2*	-11.4*	-14.7	-12.3	-16.7
	Low concentration of Indigenous identity groups [reference]	81.7	83.7	79.6	Reference					
Predominant Indigenous identity group (area-based measure)	First Nations as predominant group	70.5	73.7	67.6	-11.2*	-10.0*	-12.0*	-15.9	-13.6	-17.8
	Inuit as predominant group	69.7	73.1	66.4	-12.0*	-10.6*	-13.2*	-17.2	-14.5	-19.9
	Métis as predominant group	74.8	78.2	71.7	-6.9*	-5.5*	-7.9*	-9.2	-7.0	-11.0
	Low concentration of First Nations/Inuit/Métis identity [reference]	81.7	83.7	79.6	Reference					
Immigrant status (area-based measure)	Low foreign-born proportion	81.0	83.1	78.9	-2.9*	-2.5*	-3.1*	-3.6	-3.0	-3.9
	Medium foreign-born proportion	82.9	84.7	80.8	-1.0*	-0.9*	-1.2*	-1.2	-1.1	-1.5
	High foreign-born proportion) [reference]	83.9	85.6	82.0	Reference					
Rural/urban residence	Remote areas	77.8	80.6	75.2	-3.7*	-2.9*	-4.2*	-4.8	-3.6	-5.6
	Provincial rural areas	80.4	82.6	78.2	-1.1*	-0.9*	-1.2*	-1.4	-1.1	-1.5
	Small urban centres	80.5	82.8	78.4	-1.0*	-0.7*	-1.0*	-1.2	-0.8	-1.3
	Toronto, Montreal, and Vancouver	83.0	84.7	81.0	1.5*	1.2*	1.6*	1.8	1.4	2.0
	Large urban centres other than Toronto, Montreal and Vancouver [reference]	81.5	83.5	79.4	Reference					
Socioeconomic Determinants of Health										
Income quintile (area-based measure)	Q1 (lowest income)	79.1	81.7	76.4	-4.1*	-3.1*	-5.3*	-5.2	-3.8	-6.9
	Q2	81.1	83.4	78.8	-2.1*	-1.4*	-2.9*	-2.6	-1.7	-3.7
	Q3	81.8	83.8	79.7	-1.4*	-1.0*	-2.0*	-1.7	-1.2	-2.5
	Q4	82.3	84.1	80.5	-0.9*	-0.7*	-1.2*	-1.1	-0.8	-1.5
	Q5 (highest income) [reference]	83.2	84.8	81.7	Reference					
Education (area-based measure)	Q1 (lowest education)	79.9	82.4	77.5	-3.1*	-2.3*	-3.7*	-3.9	-2.8	-4.8
	Q2	81.0	83.2	78.9	-2.0*	-1.5*	-2.3*	-2.5	-1.8	-2.9
	Q3	81.6	83.6	79.5	-1.4*	-1.1*	-1.7*	-1.7	-1.3	-2.1
	Q4	82.2	84.1	80.2	-0.8*	-0.6*	-1.0*	-1.0	-0.7	-1.2
	Q5 (highest education) [reference]	83.0	84.7	81.2	Reference					
Deprivation index—material (area-based measure)	Q5 (most deprived)	80.1	82.6	77.6	-3.8*	-2.9*	-4.5*	-4.7	-3.5	-5.8
	Q4	81.3	83.6	79.1	-2.6*	-1.9*	-3.0*	-3.2	-2.3	-3.8
	Q3	82.0	84.1	79.9	-1.9*	-1.4*	-2.2*	-2.3	-1.7	-2.8
	Q2	82.9	84.8	80.8	-1.00*	-0.7*	-1.3*	-1.2	-0.8	-1.6
	Q1 (least deprived) [reference]	83.9	85.5	82.1	Reference					
Deprivation index—social (area-based measure)	Q5 (most deprived)	80.3	82.9	77.4	-2.8*	-1.8*	-4.2*	-3.5	-2.2	-5.4
	Q4	81.6	83.8	79.1	-1.5*	-0.9*	-2.5*	-1.8	-1.1	-3.2
	Q3	82.3	84.3	80.3	-0.8*	-0.4*	-1.3*	-1.0	-0.5	-1.6
	Q2	82.7	84.6	80.9	-0.4*	-0.1*	-0.7*	-0.5	-0.1	-0.9
	Q1 (least deprived) [reference]	83.1	84.7	81.6	Reference					
Deprivation index—material & social (area-based measure)	Q5Q5 (most deprived)	77.8	80.7	74.8	-5.9*	-4.3*	-7.7*	-7.6	-5.3	-10.3
	Q1Q1 (least deprived) [reference]	83.7	85.0	82.5	Reference					

NOTE

The purpose of the colour scaling is to map (for all indicators and stratifiers) 1- the relative and absolute inequalities. 2- the patterns of inequalities (e.g. Indigenous populations frequently experience inequalities compared to non-Indigenous). 3- the gradients of inequalities (e.g. there are frequently inequalities in a gradient across income strata). The magnitude and distribution of inequalities shown in this table should be interpreted with caution, taking into consideration one indicator at a time, the differences among the data sources used (e.g. survey vs. administrative register), and existing limitations in the measurement of the social statifiers.

Colour scaling for rate ratios below 1 and rate differences below 0 was applied using the reciprocal value and the absolute value respectively. For example, for a RR of 0.5, the colour scale applied is for the value 2.0 (1/0.5) and for a RD of -10, the colour scale for the value 10 is used. Colour scaling is only applied when the difference between the value and the reference group is statistically significant.

LEGEND

ED

> 6.6 ↑ Larger Inequality
4.3 → 6.6
3.2 → 4.3
2.2 → 3.2
1.7 → 2.2
0.0 → 1.7 ↓ Smaller Inequality

Non-applicable NA
Non-reportable F
Report with Caution E
Statistically Significant *
Reference

Annex 2. Absolute and Relative Inequalities, and Population Impact Measures for Health Adjusted Life Expectancy at Age 18.
Data Sources: CCHS - Annual Component (2000/01–2007/08) linked to Vital Statistics - Death Database (2000–2011)

Social Stratifiers		Estimate			SUMMARY MEASURES Estimate Difference (ED)			Estimate Difference Percent (ED%)		
		Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males
Overall	Both Sexes	56.8	58.4	55.1				NA		
Population Groups										
Sex/gender	Female	58.4	NA		NA	3.3*	NA	NA	5.7	NA
	Male [reference]	55.1			Reference					
Cultural/racial background	Black	F	F	F	F	F	F	F	F	F
	East/Southeast Asian	67.2	F	58.4	10.2*	F	3.3*	15.2	F	5.6
	South/Arab/West Asian	F	F	F	F	F	F	F	F	F
	Other/Multiple origins	F	F	F	F	F	F	F	F	F
	White [reference]	56.9	58.7	55.1	Reference					
Functional health	Severe impairment	26.2	27.4	24.9	-41.9*	42.6*	-41.9*	-159.8	-155.6	-168.1
	Moderate impairment	53.5	56.6	50.4	-14.6*	13.3*	-16.5*	-27.3	-23.5	-32.7
	Mild impairment	65.6	68.6	62.3	-2.6*	1.3*	-4.6*	-3.9	-1.9	-7.3
	No impairment [reference]	68.1	69.9	66.8	Reference					
Immigrant status	Immigrant	59.4	60.4	58.3	3.4*	2.6*	4.2*	5.6	4.3	7.2
	Non-immigrant [reference]	56.0	57.8	54.1	Reference					
Rural/urban residence	Remote areas	55.4	57.8	53.1	-1.8*	-1.0*	-2.3*	-3.3	-1.7	-4.4
	Provincial rural areas	55.4	57.1	53.6	-1.8*	-1.7*	-1.8*	-3.2	-3.0	-3.3
	Small urban centres	57.7	59.1	56.3	0.5	0.3	0.9*	0.9	0.5	1.6
	Toronto, Montréal, and Vancouver	58.9	60.0	57.5	1.7*	1.2*	2.1*	2.9	2.0	3.7
	Large urban centres other than Toronto, Montréal and Vancouver [reference]	57.2	58.8	55.4	Reference					
Socioeconomic Determinants of Health										
Income quintile (household)	Q1 (lowest income)	50.2	52.1	47.7	-11.3*	-10.8*	-12.9*	-22.4	-20.7	-27.1
	Q2	55.2	57.8	52.8	-6.2*	-5.1*	-7.9*	-11.2	-8.8	-15.0
	Q3	58.2	59.9	56.7	-3.3*	-2.9*	-3.9*	-5.6	-4.9	-6.9
	Q4	58.8	59.5	58.1	-2.6*	-3.3*	-2.6*	-4.5	-5.6	-4.5
	Q5 (highest income) [reference]	61.4	62.9	60.7	Reference					
Education (aged 18+)	Less than high school	51.1	53.1	49.1	-11.3*	-11.3*	-12.3*	-22.1	-21.3	-25.1
	High school graduate	57.3	58.3	56.0	-5.1*	-6.1*	-5.4*	-8.9	-10.5	-9.7
	Some post-secondary education	55.6	56.9	54.1	-6.9*	-7.4*	-7.4*	-12.3	-13.1	-13.7
	Community college/Technical school/ University certificate	57.9	60.1	55.6	-4.5*	-4.3*	-5.9*	-7.9	-7.1	-10.6
	University graduate [reference]	62.4	64.4	61.5	Reference					
Employment status (aged 18-75)	No job last week, looked for work in the past 4 weeks	55.8	58.6	53.5	-3.4*	-2.3*	-4.1*	-6.1	-4.0	-7.6
	No job last week, did not look for work in the past 4 weeks	54.4	56.9	49.6	-4.8*	-4.1*	-7.9*	-8.8	-7.2	-15.9
	Permanently unable to work	25.3	26.6	24.2	-34.0*	-34.4*	-33.4*	-134.3	-129.6	-137.8
	Had a job last week [reference]	59.2	61.0	57.6	Reference					

NOTE

The purpose of the colour scaling is to map (for all indicators and stratifiers) 1- the relative and absolute inequalities, 2- the patterns of inequalities (e.g. Indigenous populations frequently experience inequalities compared to non-Indigenous), 3- the gradients of inequalities (e.g. there are frequently inequalities in a gradient across income strata). The magnitude and distribution of inequalities shown in this table should be interpreted with caution, taking into consideration one indicator at a time, the differences among the data sources used (e.g. survey vs. administrative register), and existing limitations in the measurement of the social statifiers.

Colour scaling for rate ratios below 1 and rate differences below 0 was applied using the reciprocal value and the absolute value respectively. For example, for a RR of 0.5, the colour scale applied is for the value 2.0 (1/0.5) and for a RD of -10, the colour scale for the value 10 is used. Colour scaling is only applied when the difference between the value and the reference group is statistically significant.

LEGEND

ED

ED		
> 6.6	■	Larger Inequality ↑
4.3 → 6.6	▨	
3.2 → 4.3	▨	
2.2 → 3.2	▨	
1.7 → 2.2	□	
0.0 → 1.7	□	↓ Smaller Inequality

Non-applicable	NA
Non-reportable	F
Report with Caution	E
Statistically Significant	*
Reference	□

References

(1) OECD. Health at a Glance 2017. Organisation for Economic Co-operation and Development; 2017 [cited 20 November, 2017].

(2) Wolfson MC. Health-adjusted Life Expectancy. Health Reports. 1996;8(1):41.

(3) Public Health Agency of Canada Steering Committee on Health-Adjusted Life Expectancy. Health-Adjusted Life Expectancy in Canada: 2012 Report by the Public Health Agency of Canada 2012.

(4) Gold MR, Stevenson D, Fryback DG. HALYs and QALYs and DALYs, Oh my: Similarities and differences in summary measures of population health. Annual Review of Public Health. 2002;23:115.

(5) Chetty R, Stepner M, Abraham S, al e. The association between income and life expectancy in the united states, 2001-2014. JAMA. 2016 04/26;315(16):1750-66.

(6) van Baal P,H.M., Hoogenveen RT, de Wit AG, Boshuizen HC. Estimating health-adjusted life expectancy conditional on risk factors: results for smoking and obesity. Population Health Metrics. 2006 11/03;4(1):14.

(7) Luy M, Minagawa Y. Gender gaps - Life expectancy and proportion of life in poor health. Health Reports. 2014;25(12):12,12-19.

(8) Pampalon R, Hamel D, Gamache P. A comparison of individual and area-based socio-economic data for monitoring social inequalities in health. Health Reports. 2009;20(4):85,85-94.

(9) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(10) Chen J. The health of Canada's immigrants in 1994-95. Health Reports. 1996;7(4):33.

(11) World Health Organization. [Internet]. Life expectancy at birth (years), 2000-2015: Both sexes: 2015 [updated 2016 cited 20 November, 2017]; Available from: http://gamapserver.who.int/gho/interactive_charts/mbd/life_expectancy/atlas.html.

(12) World Health Organization. [Internet]. Healthy life expectancy at birth (years), 2000-2015: Both sexes: 2015 [updated 2016 cited 20 November, 2017]; Available from: http://gamapserver.who.int/gho/interactive_charts/mbd/hale_1/atlas.html.

(13) Wood R, Sutton M, Clark D, McKeon A, Bain M. Measuring inequalities in health: the case for healthy life expectancy. J Epidemiol Community Health. 2006;60:1089.

(14) Olshansky SJ, Antonucci T, Berkman L, Binstock RH, Boersch-Supan A, Cacioppo JT, et al. Differences In Life Expectancy Due To Race And Educational Differences Are Widening, And Many May Not Catch Up. Health Affairs. 2012;31(8):1803.

(15) Wilkins R, Adams O, Brancker A. Changes in mortality by income in urban Canada from 1971 to 1986. Health Rep. 1989;1(2):137-74.

(16) Statistics Canada DD. Projections of the Aboriginal populations, Canada, provinces and territories 2001 to 2017. 2005 [cited 20 November, 2017].

(17) United Nations Development Programme. [Internet]. Human Development Reports: Life expectancy at birth (years) [updated 2013 14 June, 2013; cited 20 November, 2017]; [about 14 screens]. Available from: http://hdr.undp.org/en/69206.

(18) Berthelot J, Wilkins R and Ng E. Trends in mortality by neighbourhood income in urban Canada from 1971 to 1996 [Canadian Community Health Survey-2002 Annual Report]. Statistics Canada; 2002 [cited 20 November, 2017].

INEQUALITIES IN INFANT MORTALITY IN CANADA

INEQUALITIES HIGHLIGHTS

- Canadians living in areas with a high concentration of Indigenous people have infant mortality rates much higher than those living in areas with a low concentration of Indigenous people. Mortality rates are 3.9 times higher in areas with a high concentration of Inuit, 2.3 times higher in areas with a high concentration of First Nations people, and 1.9 times higher in areas with a high concentration of Métis people. This difference represents 10.0, 4.6, and 3.2 more infant deaths per 1 000 live births in areas with a high concentration of Inuit, First Nations, and Métis people, respectively.
- Infant mortality rates in areas with the lowest education levels and lowest incomes are 1.6 and 1.5 times the rate in the areas with the highest education level and highest incomes, respectively. This equates to 1.7 and 1.5 more infant deaths per 1 000 live births, respectively. Infant mortality rates increase with each decreasing level of education.
- Canadians living in the most materially deprived areas have rates of infant mortality 1.6 times the rates of those living in the least deprived areas. This equates to 1.9 more infant deaths per 1 000 live births.
- Remote communities have rates of infant mortality 1.5 times the rate in large Canadian cities (other than Montréal and Vancouver). This translates to 1.9 more infant deaths per 1 000 live births.

ACRONYM	FULL NAME
CI	Confidence Interval
OECD	Organisation for Economic Co-operation and Development

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Infant mortality is a widely accepted indicator of economic and social development, and is therefore considered a cornerstone of population health across diverse settings (1,2). Infant mortality refers to deaths of babies in the first year of life, and the rate is usually expressed as per 1 000 live births. In 2011, 1 810 (4.8 per 1,000 births) infants died in Canada (3). Based on data from 2005 to 2009, the leading causes of infant deaths in Canada were immaturity (29.4%), congenital anomalies (22.0%), asphyxia (10.4%), infection (6.5%), and sudden infant death syndrome (6.4%) (4).

The socioeconomic burden of infant mortality in Canada is difficult to estimate. The loss of an infant can have a substantial psychological impact on parents and caregivers; it has been associated with post-traumatic stress disorder, depression, anxiety, and sleep disorders (5). Preliminary research has estimated that the average cost of hospitalization for the approximately 1 600 infants who died in an acute care hospital setting in 2011 was $20 800 per hospital visit (3).

Infant mortality is strongly associated with socioeconomic status in Canada (3,4). While Canadian infant mortality rates decreased from 5.2 per 1 000 live births in 2001 to 4.8 per 1 000 live births in 2011, inequalities in rates between income groups continue to persist (3). During this 10-year period, the infant mortality rate in the lowest income level was almost 1.5 times the rate in the highest income level, with approximately 2 more infant deaths per 1 000 live births in the lowest income level than in the highest income level (3). Infant mortality also disproportionally affects certain populations in Canada, and striking disparities in rates and underlying causes of infant mortality have been observed between Indigenous and non-Indigenous Canadians (6-10).

Infant mortality was selected as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter).

METHODS

Infant mortality data were obtained from the Canadian Mortality Database (2008–2011), maintained by Statistics Canada and based on provincial and territorial death certificate information. Data from Ontario were excluded due to data quality issues (4). For this analysis, infant mortality and live birth data were restricted to infants with a birth weight of at least 500 grams. Few individual-level demographic and socioeconomic details are available from administrative data sources. Area-based measures of inequality across social stratifiers were derived at the dissemination area level using data from the 2006 Census of Population. Consequently, these findings apply to the level of the dissemination area and not the level of the individual. (For more detailed information on area-based measures, see Methodology: Technical Notes).

Inequalities in infant mortality rates were assessed by measuring differences by sex/gender and by the following area-based socioeconomic and sociodemographic stratifiers. Sociodemographic stratifiers include immigrant status, Indigenous identity[14], and rural/urban residence. Socioeconomic stratifiers include income, education, and social and material deprivation.

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported with the corresponding 95% confidence intervals (CIs). Statistical significance was assessed using 95% confidence intervals (11). Sex/gender-specific inequalities for all of the area-based measures were also calculated but only reported if the differences were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: rate ratio, rate difference, attributable fraction, population attributable fraction, population attributable rate, and population impact number.

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[14] An area is considered to have a high concentration of Indigenous residents if 33% or more of its population report their identity as Indigenous (First Nations living on and off reserve, Inuit, or Métis). An area with a low concentration of Indigenous residents has less than 33% of its residents reporting an Indigenous identity.

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in Canada. (For more information, see the Methodology chapter.)

FINDINGS

With the exception of immigrant status, significant inequalities in infant mortality rates were seen for all social stratifiers between 2008 and 2011. Inequalities were greatest in areas with a high concentration of Indigenous people. Areas with the highest concentration of Inuit had the highest rates of infant mortality (Annex 1). (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Sex/Gender

Mortality rates among male infants were 1.2 (95% CI: 1.1–1.3) times that among female infants: 4.0 (95% CI: 3.8–4.2) per 1 000 live births in the former compared with 3.4 (95% CI: 3.2–3.6) per 1 000 live births in the latter. If the male infant mortality rate had been the same as the rate for female infants, there would, potentially, be 76 (95% CI: 36–121) fewer infant deaths in Canada annually (Figure 1).

Indigenous Peoples

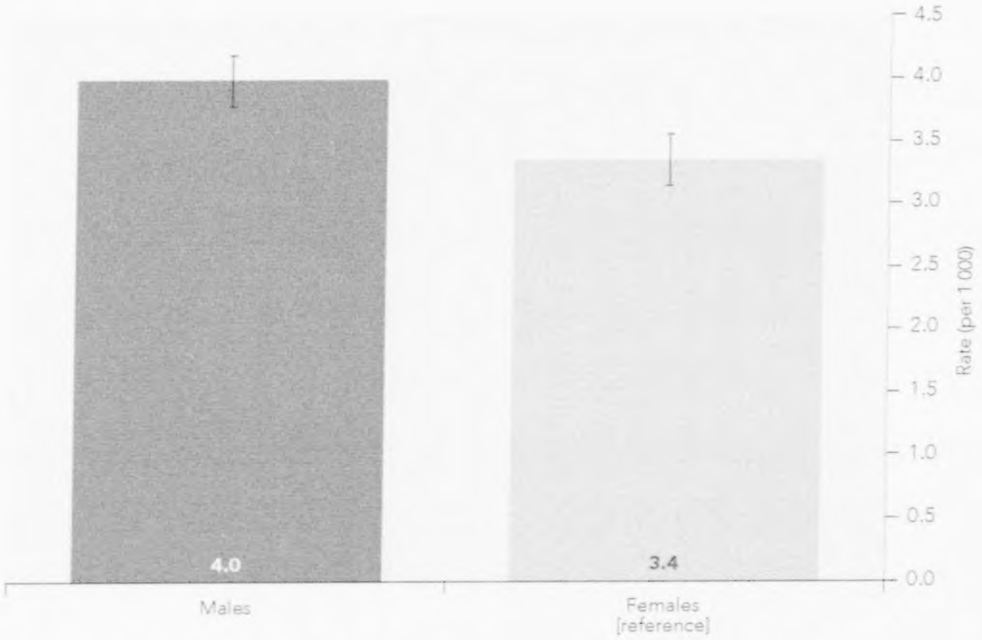
Areas with a high concentration of Inuit, First Nations, and Métis people had infant mortality rates that were, respectively, 3.9 (95% CI: 3.0–5.1), 2.3 (95% CI: 2.0–2.7), and 1.9 (95% CI: 1.3–2.6) times the rates in areas with a low concentration of people who identified as Indigenous. This represents more than 10.0 (95% CI: 6.6–13.4), 4.6 (95% CI: 3.5–5.7), and 3.2 (95% CI: 0.8–5.6) infant deaths per 1 000 live births in areas with a high concentration of Inuit, First Nations, and Métis people, respectively (Figure 2).

If the areas where Inuit, First Nations, and Métis populations predominated had the same rates of infant mortality as areas with a low concentration of Indigenous people, rates of infant mortality would be reduced by 74.4% (95% CI: 66.6–80.4%), 57.4% (95% CI: 54.4–64.1%), and 48.0% (95% CI: 25.6–63.7%), respectively. This would equate to, respectively, 14 (95% CI: 8–20), 40 (95% CI: 28–53), and 5 (95% CI: 1–9) fewer infant deaths in Canada annually.

If rates of infant mortality in areas with a high concentration of Indigenous people were the same as in areas with a low concentration of Indigenous people, there would be 40 fewer infant deaths in First Nations-dominant areas, 14 fewer infant deaths in Inuit-dominant areas, and 5 fewer infant deaths in Métis-dominant areas every year.

FIGURE 1

Infant Mortality Rate per 1 000 Live Births (birth weight 500+ g) by Sex/Gender, Canada (excluding Ontario[a]), 2008–2011



	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 1 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 1 000	POPULATION IMPACT NUMBER (PIN)
Males	1.2*	0.6*	15.8*	8.7*	0.3*	76*
Females [Reference]	1.0	0.0	0.0	0.0	0.0	0

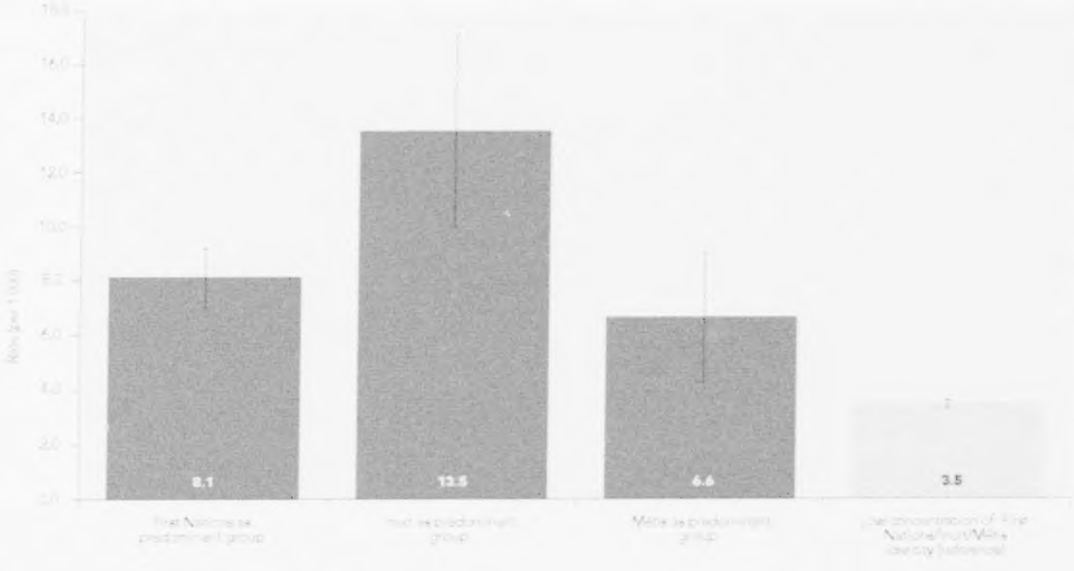
*: Significantly different from reference group

[a] Ontario data are excluded due to poor data quality.

Source: Vital Statistics – Canadian Birth Database (CBDB) 2008–2011 linked to Vital Statistics – Canadian Mortality Database (CMDB) 2008–2010

FIGURE 2

Infant Mortality Rate per 1 000 Live Births (birth weight 500+ g) by Indigenous Identity, Canada (excluding Ontario[a]), 2008–2011



	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 1 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 1 000	POPULATION IMPACT NUMBER (PIN)
First Nations as predominant group	2.3*	4.6*	57.4*	4.6*	0.2*	40*
Inuit as predominant group	3.9*	10.0*	74.4*	1.6*	0.1*	14*
Métis as predominant group	1.9*	3.2*	48.0*	0.6*	0.0*	5*
Low concentration of First Nations/Inuit/Métis identity [reference]	1.0	0.0	0.0	0.0	0.0	0

* Significantly different from reference group
[a] Ontario data are excluded due to poor data quality
Area-level measures of Indigenous identity derived from the 2006 Census of Population
Predominant group: ≥ 33% of residents in dissemination area report Indigenous identity with majority belonging to indicated group
Source: Vital Statistics – Canadian Birth Database (CBDB) 2008–2011 linked to Vital Statistics – Canadian Mortality Database (CMDB) 2008–2010

Income

In the lowest-income areas, rates of infant mortality were 1.5 (95% CI: 1.3–1.7) times the rates of the highest-income areas. The infant mortality rate in the lowest income quintile was significantly higher than the rate in the second lowest income quintile, but there were no significant differences in rates between the other quintiles. This difference represents 1.5 (95% CI: 1.0–2.0) more infant deaths per 1 000 live births in the lowest income areas than in the highest income areas (Figure 3).

If people living in the lowest-income areas had the same rates of infant mortality as those living in the highest-income areas, there would be a 31.6% (95% CI: 22.6–39.6%) reduction in the rate of infant mortality for people living in the lowest-income areas. This would represent an overall reduction of 8.8% (95% CI: 6.1–11.6%) and correspond to 76 (95% CI: 47–108) fewer infant deaths annually in Canada.

Education

A step-wise inequality gradient in infant mortality was observed, with infant mortality increasing as education level decreased. Infant mortality in areas with the lowest level of education was 1.6 (95% CI: 1.4–1.8) times that of areas with the highest level of education (Figure 4).

If Canadians living in areas with the lowest education levels had the same rates of infant mortality as those living in areas with the highest education levels, there would be a 37.6% (95% CI: 29.1–45.0) reduction in the infant mortality rate in the lowest education area and an 11.8% (95% CI: 8.9–14.8) reduction in the overall rate. This would represent 103 (95% CI: 70–138) fewer infant deaths annually in Canada.

Material and Social Deprivation

The infant mortality rate in the most materially deprived[15] areas was 1.6 (95% CI: 1.5–1.9) times the rate in the least deprived areas. The infant mortality rate in the most materially deprived quintile—5.0 (95% CI: 4.6–5.3) per 1 000—was significantly higher than the rates in the next two most materially deprived quintiles (3.4–3.6 per 1 000). However, these latter two did not differ significantly from the rates in the two least materially deprived quintiles. Compared with the least materially deprived areas, there were 1.9 (95% CI: 1.5–2.4) more infant deaths per 1 000 live births in the most materially deprived areas (Figure 5).

If Canadians living in the most materially deprived areas had the same rates of infant mortality as those in the least materially deprived areas, there would be a 39.0% (95% CI: 31.1–46.1%) reduction in infant mortality rates among those living in the most materially deprived areas. This would represent 96 (95% CI: 67–127) fewer infant deaths annually.

The data also show that the difference in the infant mortality rate between the least materially deprived quintile and the other quintiles was especially high for male infants.

Canadians living in the most socially deprived areas had an infant mortality rate that was 1.2 (95% CI: 1.1–1.4) times the rate of those living in the least deprived areas. In both sexes, significant differences in rates were seen only when comparing rates among Canadians living in the most and least socially deprived areas (Annex 1).

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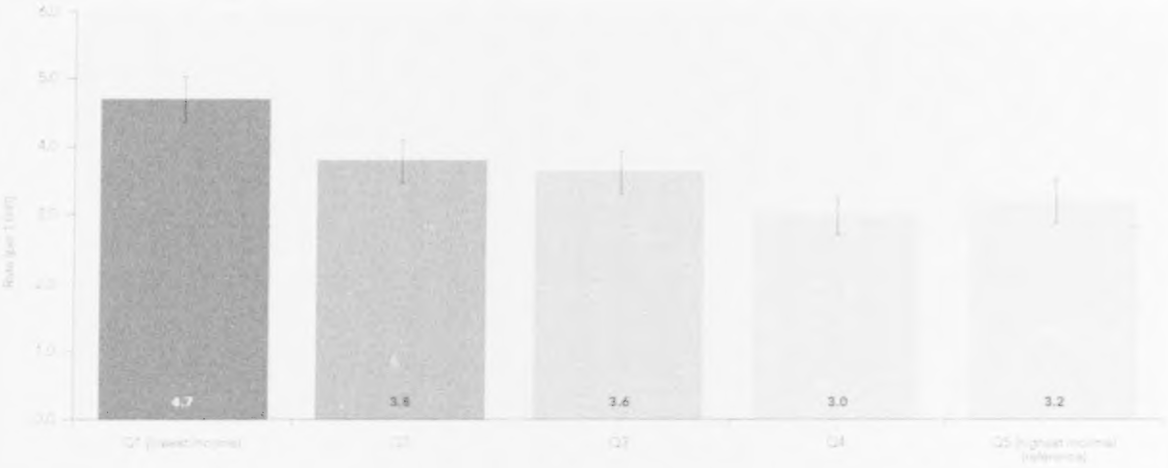
[15] For a definition of the deprivation index, see the Methodology chapter.

FIGURE 3

Infant Mortality Rate per 1 000 Live Births (birth weight 500+ g) by Income Quintile, Canada (excluding Ontario[a]), 2008–2011

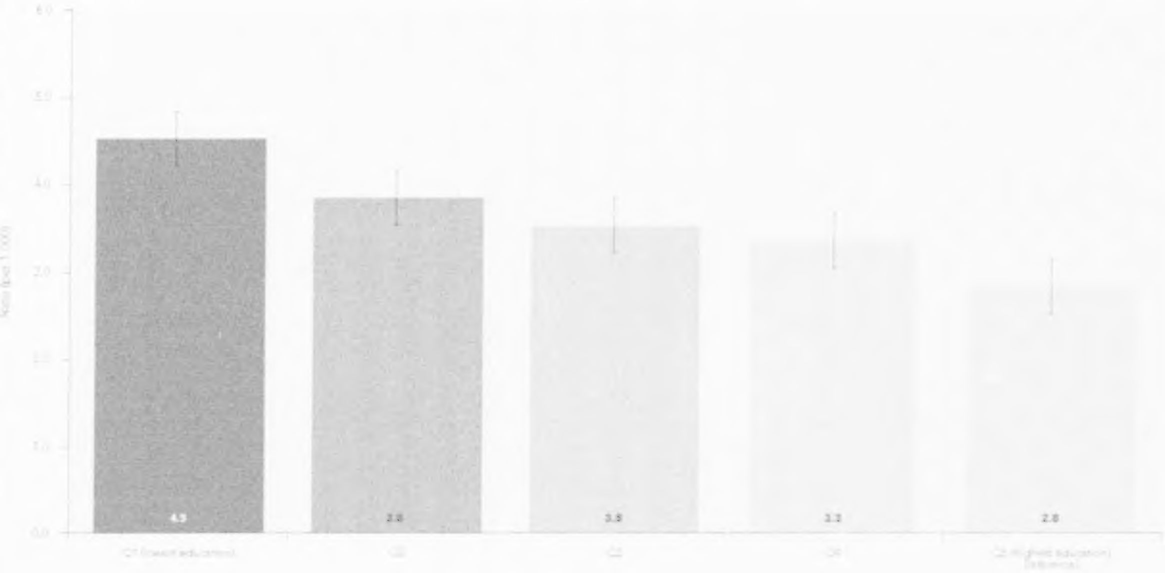


	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 1 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 1 000	POPULATION IMPACT NUMBER (PIN)
Q1 (lowest income)	1.5*	1.5*	31.6*	8.8*	0.3*	76*
Q2	1.2*	0.6*	15.1*	3.1*	0.1*	27*
Q3	1.1	0.4	11.6	2.3	0.1	20
Q4	0.9	−0.2	NA	NA	NA	NA
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
Q: Quintile
*: Significantly different from reference group
[a] Ontario data are excluded due to poor data quality.
Area-level measures of income quintiles derived from the 2006 Census of Population.
Source: Vital Statistics – Canadian Birth Database (CBDB) 2008–2011 linked to Vital Statistics – Canadian Mortality Database (CMDB) 2008–2010

FIGURE 4

Infant Mortality Rate per 1 000 Live Births (birth weight 500+ g) by Education Quintile, Canada (excluding Ontario[a]), 2008–2011

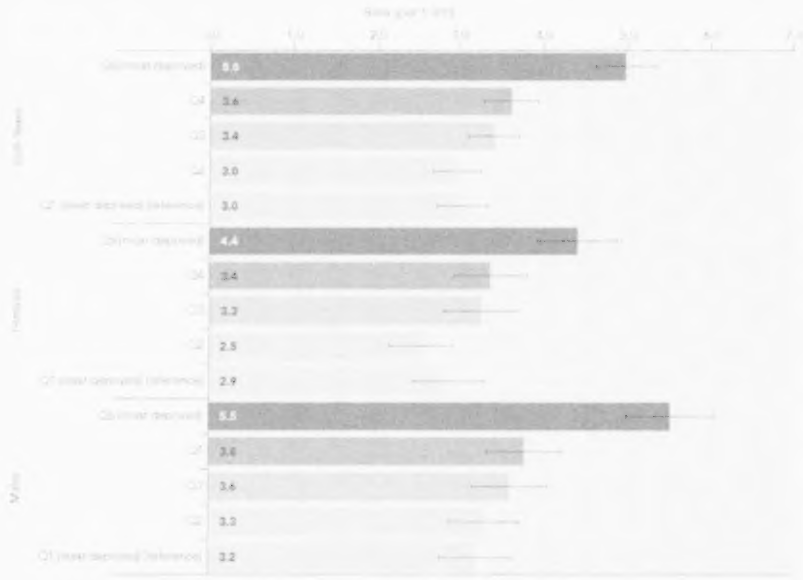


	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 1 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 1 000	POPULATION IMPACT NUMBER (PIN)
Q1 (lowest education)	1.6*	1.7*	37.6*	11.8*	0.4*	103*
Q2	1.4*	1.0*	26.4*	5.7*	0.2*	49*
Q3	1.2*	0.7*	19.9*	3.6*	0.1*	32*
Q4	1.2*	0.5*	15.9*	2.5*	0.1*	22*
Q5 (highest education) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
*: Significantly different from reference group
[a] Ontario data are excluded due to poor data quality.
Area-level measures of education quintiles derived from the 2006 Census of Population.
Source: Vital Statistics – Canadian Birth Database (CBDB) 2008–2011 linked to Vital Statistics – Canadian Mortality Database (CMDB) 2008–2010

FIGURE 5

Infant Mortality Rate per 1 000 Live Births (birth weight 500+ g) by Material Deprivation and Sex/Gender, Canada (excluding Ontario*), 2008–2011



BOTH SEXES	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 1 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 1 000	POPULATION IMPACT NUMBER (PIN)
Q5 (most deprived)	1.6*	1.9*	39.0*	11.6*	0.4*	96*
Q4	1.2*	0.6*	16.3*	3.2*	0.1*	26*
Q3	1.1	0.4	11.1	2.1	0.1	17
Q2	1.0	−0.1	NA	NA	NA	NA
Q1 (least deprived) [reference]	1.0	0.0	0.0	0.0	0.0	0
FEMALES						
Q5 (most deprived)	1.5*	1.5*	34.7*	10.0*	0.3*	37*
Q4	1.2	0.5	14.3	2.8	0.1	10
Q3	1.1	0.4	11.9	2.3	0.1	9
Q2	0.9	−0.3	NA	NA	NA	NA
Q1 (least deprived) [reference]	1.0	0.0	0.0	0.0	0.0	0
MALES						
Q5 (most deprived)	1.7*	2.3*	42.3*	12.9*	0.5*	59*
Q4	1.2	0.6	16.1	3.0	0.1	14
Q3	1.1	0.4	12.2	2.2	0.1	10
Q2	1.0	0.1	3.9	0.7	0.0	3
Q1 (least deprived) [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
Q: Quintile
*: Significantly different from reference group
* Ontario data are excluded due to poor data quality.
Area-level measures of deprivation index derived from the 2006 Census of Population.
Source: Vital Statistics – Canadian Birth Database (CBDB) 2008–2011 linked to Vital Statistics – Canadian Mortality Database (CMDB) 2008–2010

Rural/Urban Residence

At 5.4 infant deaths per 1 000 live births, the infant mortality rate in remote communities[16] was 1.5 (95% CI: 1.4–1.7) times higher than the rate in large Canadian cities other than Montréal and Vancouver (3.5 infant deaths per 1 000 live births). At 3.1 (95% CI: 2.8–3.3) per 1 000 live births, Montréal and Vancouver had the lowest infant mortality rate (Figure 6).

DATA GAPS/LIMITATIONS

Most vital statistics records in Canada do not contain socioeconomic or sociodemographic data other than age and sex. As a result, area-based measures of inequality across the social stratifiers were derived at the dissemination area level using data from the 2006 Census of Population.

This assumes that socioeconomic and sociodemographic groups are uniform within a dissemination area, a limitation that could lead to misclassification bias and the underestimation of inequalities in infant mortality. Although the directions of disparities are the same in studies that use area-based measures and individual-level measures, the disparities tend to be larger when measured at the level of the individual (12).

Area-based measures may also attenuate estimates in rural areas because rural postal codes are less precise in determining dissemination areas. Moreover, vital statistics records in Canada are more likely to be influenced by regional variations in birth registrations, especially for extremely small infants. To account for this limitation, our analysis was restricted to infants with a birth weight of at least 500 grams (13).

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (11), calculating *p*-values would confirm statistically significant differences.

The measures used in this report quantify the inequalities experienced by broadly defined social groups that are presumed to be distinct. The inequalities facing individuals and communities who hold multiple and intersecting identities are not captured here.

The disproportionate burden of infant mortality experienced by some groups is driven by a complex system of social and structural drivers of health that have yet to be fully explored and understood. Another important limitation is that this analysis does not examine mortality rates in the neonatal and postnatal periods, where socioeconomic inequalities are more marked (14). Finally, infant deaths due to specific causes in the first year of life (e.g. sudden infant death syndrome and infections) are more common in lower socioeconomic status groups than in higher socioeconomic status groups (15,16). As this analysis was not stratified by cause of death, the distribution of risk factors for these underlying causes of infant death cannot be examined.

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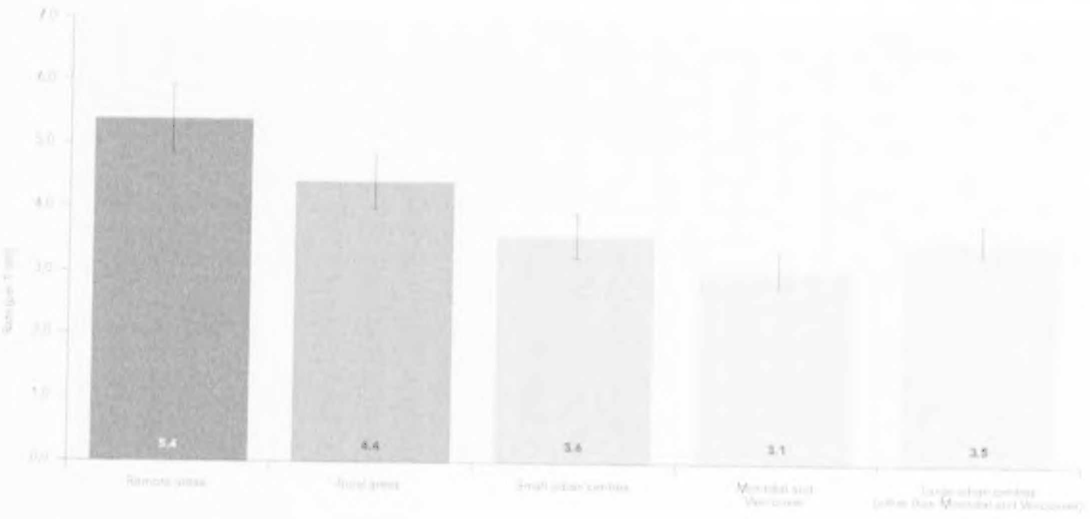
16. For definitions of rural/urban subgroups, see the Methodology chapter.

FIGURE 6

Infant Mortality Rate per 1 000 Live Births (birth weight 500+ g) by Rural/Urban Residence, Canada (excluding Ontario*), 2008–2011



	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 1 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 1 000	POPULATION IMPACT NUMBER (PIN)
Remote areas	1.5*	1.9*	34.5*	5.0*	0.2*	44*
Rural areas	1.2*	0.9*	20.0*	3.0*	0.1*	26*
Small urban centres	1.0	0.0	1.1	0.2	0.0	1
Montréal and Vancouver	0.9*	−0.5*	NA	NA	NA	NA
Large urban centres (other than Montréal and Vancouver)	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
*: Significantly different from reference group
* Ontario data are excluded due to poor data quality.
Source: Vital Statistics – Canadian Birth Database (CBDB) 2008–2011 linked to Vital Statistics – Canadian Mortality Database (CMDB) 2008–2010

DISCUSSION

Infant mortality has often been used as an indicator of a country's social and economic progress because it demonstrates inequalities across a range of social stratifiers. Consistent with data from many countries across the world, our findings highlighted a difference between sexes in infant mortality rates, with mortality rates among male infants 1.2 times the rates among female infants (17).

Given the level of socioeconomic development, the infant mortality rate in Canada is relatively high—scoring in thirtieth place out of the 36 countries in the Organisation for Economic Co-operation and Development (OECD) in 2012–2014, after most European countries as well as Australia, Israel, Japan, the Republic of South Korea, and New Zealand. The Canadian infant mortality rate of 4.9 infant deaths per 1 000 live births during this period was more than twice that of the five OECD countries with the lowest rates (2). However, international comparisons have to be interpreted with caution because of differences in birth registration practices and in reporting births at the low end of the birth weight and gestational age spectrum (13,18,19). When infant deaths with a birth weight under 1 000 grams are excluded from reporting, as recommended by the World Health Organization (20), Canada's relative performance is similar to that of other OECD countries (13). Nevertheless, there is some evidence that post-neonatal mortality rates (from 28 days to 1 year after birth), which are more directly linked to socioeconomic and environmental factors, are higher in Canada than in other developed countries (14).

In Canada, infant mortality rates are especially high among Indigenous people Colonization has long been recognized as an important determinant of health. Many Indigenous people and their families in Canada have suffered the loss of connections to their land, cultures, languages, and traditional ways of life through colonial practices such as forced relocations, the Indian reservation system, and the residential schooling system. Moreover, gendered aspects of colonization need to be considered in the context of infant mortality and women's health in general. In Canada, this includes a history of forced sterilization of Indigenous women, out-of-jurisdiction care for pregnant Indigenous women in rural and remote communities, and higher rates of violence experienced by Indigenous women than by non-Indigenous women (21).

Infant mortality rates among First Nations people and Inuit have been reported to range from 1.7 to more than 5 times the rates among non-Indigenous Canadians, and these inequalities are especially stark for the post-neonatal period (6-8,22). Similar disparities in infant mortality rates have been found in Australia, the United States, and New Zealand (9). In Australia, the disparity in infant deaths between Indigenous and non-Indigenous people decreased between 1998 and 2006, from a rate ratio of 3.0 to 2.8. (In 2006, the rate of Indigenous infant deaths was 11.6 per 1 000 live births compared with 5.1 per 1 000 live births among non-Indigenous infants.) In New Zealand, the perinatal mortality rate was higher among Maori people compared with New Zealanders of European origin (9).

In the United States, where racial disparities in infant mortality between White and Black infants have long been recognized, emerging research shows that infant mortality rates are higher among Native Hawaiian Americans (9.0 per 1 000 live births) and American Indian/Alaska Native Americans (8.3 per 1 000 live births) than among White Americans (5.7 per 1 000 live births) (23).

In all these countries and in Canada, the disparities between Indigenous and non-Indigenous infant mortality rates are most marked in the post-neonatal period. The rates of key risk factors, such as preterm birth and low birth-weight, are also considerably higher among Indigenous peoples than among non-Indigenous people (8,9,22).

The largest inequalities in infant mortality rates were seen by Indigenous identity. Areas with a high concentration of Indigenous peoples, especially Inuit, had higher infant mortality rates than areas with a low concentration of Indigenous peoples. There may be many reasons for this inequality. Indigenous Canadians disproportionately experience risk factors that impact infant mortality, such as elevated smoking rates among women; higher rates of preterm birth, poverty, food insecurity, unemployment, and inadequate housing; and inadequate access to health care with a higher likelihood of travel from home to seek maternity care (7,9,22). Underlying causes of infant death, such as sudden infant death syndrome, respiratory tract infections, and congenital anomalies, are also more frequent among Indigenous infants than among non-Indigenous infants (8,16).

Infant mortality rates have been consistently higher among Indigenous peoples, particularly Inuit (6,8). A large birth cohort study from Quebec that used maternal mother tongue as a proxy for ethnicity showed that the relative risk for infant mortality among Inuit was 5.3 compared with the risk among non-Indigenous Canadians (7). National studies that used area-based measures showed slightly more attenuated relative risks (from 3.61 to 3.89) (6,22). Provincial and territorial breakdowns also found that the infant mortality rate in Canada was the highest in Nunavut, at 14.0 per 1 000 live births. This is almost 3 times the national average (4).

The intersection of Indigenous identity and neighbourhood socioeconomic characteristics may also play an important role in the elevated risk of infant death among Indigenous people in Canada. A large, retrospective birth cohort study of all live births in Manitoba found that First Nations infants in Manitoba were twice as likely to die during their first year of life compared with infants who were not First Nations. The study also found that First Nations people were 3.8 times more likely to live in neighbourhoods with the lowest income quintile, 3.0 times more likely to live in neighbourhoods with the lowest education quintile, and 3.4 times more likely to live in neighbourhoods with the highest unemployment quintile compared with people who were not First Nations (16).

Socioeconomic factors are associated with inequalities in infant mortality rates in Canada. Relative risk of mortality in areas with the lowest levels of education and income is about 50% to 60% higher than in areas with the highest levels of education and income. Across income levels, the infant mortality rate was highest among Canadians living in the lowest-income areas. However, income-based disparities in infant mortality rates have been declining in Canada. The difference in infant mortality between the lowest and the highest income quintiles fell from 9.8 per 1 000 in 1971 to 2.4 per 1 000 in 1996. Our study showed an even lower inter-quintile difference, with the rate of 1.5 per 1 000 in 2008–2011, which suggests a narrowing of income-related disparities in infant mortality in Canada over the long term (24).

Other large, population-based Canadian studies also found patterns of inequalities in infant mortality rates by income (3,25), including a negative gradient between level of education and infant mortality rates. Education, particularly maternal education, has also been consistently found to be inversely related to infant mortality, even after adjusting for risk factors such as maternal age, parity, sex of the infant, birth weight, and gestational age (10,15,26).

Extreme material deprivation plays an important role in infant mortality rates. The rate among people living in the most materially deprived areas was 37% higher than the rate in the second most materially deprived areas. The relative differences in rates between the other material deprivation groups were much smaller, which may point to the intersectionality of many risk factors in extremely materially disadvantaged communities. Neighbourhood-level socioeconomic deprivation may create disparities through women's access to material resources and services (27). A review of studies of neighbourhood socioeconomic status and infant mortality outcomes in western Europe also found neighbourhood deprivation to be related to birth outcomes (27).

Rates of infant mortality were higher in rural areas than in urban areas. The inequalities in infant mortality between rural and urban areas may be explained by regional differences in maternal education levels. This means that infants with mothers with low educational attainment who live in rural areas are more vulnerable to death (10). Some studies found a significantly higher risk of infant death due to immaturity-related conditions associated with low maternal education in rural areas compared with urban areas. The reason for this remains unclear, but access to high-quality neonatal intensive care may be more limited for mothers with low education levels living in rural settings (10).

While the infant mortality rate in Canada has improved over the past few decades, this improvement is not equally distributed. Inequalities in infant mortality are prevalent across a range of social stratifications. For example, infant mortality is higher among male infants, for those living in rural areas, and in neighbourhoods with a high concentration of Indigenous people. There is also a general socioeconomic gradient in infant mortality, with rates increasing as income and education levels decrease, and as social and material deprivation increases. Although individual risk factors can play a role in infant mortality, it is largely affected by a range of social, economic and environmental factors. Broader conditions, such as neighbourhood conditions, parental education and access to nutritious foods, are directly linked to the social determinants of health (4). To address these inequalities, a wide variety of interventions targeting different risk factors and conditions that influence the health of the mother-to-be, well before the perinatal period, and the infant should be used. Such interventions, along with the necessary programs, policy, and research designed to address the social determinants of infant mortality, can be informed and supported by the ongoing surveillance of inequalities. Furthermore, continuous monitoring and measuring can serve to identify any changes in infant mortality and the social determinants of infant mortality over time.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Infant Mortality Rate per 1 000 Live Births (birth weights 500+ g)*. Data Source: CBDB and CMDB 2008–2011

[illegible]

Note: * Ontario data are excluded due to poor data quality.

The purpose of the colour scaling is to map (for all indicators and stratifiers): 1- the relative and absolute inequalities; 2- the patterns of inequalities (e.g. Indigenous populations frequently experience inequalities compared to non-Indigenous); 3- the gradients of inequalities (e.g. there are frequently inequalities in a gradient across income strata). The magnitude and distribution of inequalities shown in this table should be interpreted with caution, taking into consideration one indicator at time, the differences among the data sources used (e.g. survey vs. administrative register), and existing limitations in the measurement of the social stratifiers.

Colour scaling for rate ratios below 1 and rate differences below 0 was applied using the reciprocal value and the absolute value respectively. For example, for a RR of 0.5, the colour scale applied is for the value 2.0 (1/0.5) and for a RD of -10, the colour scale for the value 10 is used. Colour scaling is only applied when the difference between the value and the reference group is statistically significant.

LEGEND

		RR	RD per 1 000		
Non-applicable	NA	> 1.8	> 9.3	▇	Larger inequality
Non-reportable	F	1.5 → 1.8	2.8 → 9.3	▆	↑
Report with Caution	E	1.3 → 1.5	1.2 → 2.8	▅	
Statistically Significant	*	1.2 → 1.3	0.6 → 1.2	▃	
Reference	░	1.1 → 1.2	0.3 → 0.6	▂	↓
		0.0 → 1.1	0.0 → 0.3	▁	Smaller inequality

References

(1) Reidpath D, Allotey P. Infant mortality rate as an indicator of population health. J Epidemiol Commun Health. 2003;57(5):344-6.

(2) Organisation for Economic Co-operation and Development. [Internet]. Paris: OECD; 2014. Infant mortality rates (indicator) [updated 2017 cited 2017 Jun 22]; [about 4 screens]. Available from: https://data.oecd.org/healthstat/infant-mortality-rates.htm.

(3) Canadian Institute for Health Information. *Trends in Income- Related Health Inequalities in Canada: Technical Report.* Ottawa, ON: CIHI; 2016 [cited 20 November, 2017].

(4) Public Health Agency of Canada. Perinatal health indicators for Canada 2013: a report from the Canadian perinatal surveillance system [Internet]. Ottawa, ON: Public Health Agency of Canada; 2013 [cited 2017 Jun 22]. Available from: http://publications.gc.ca/collections/collection_2014/aspc-phac/HP7-1-2013-eng.pdf.

(5) Kersting A, Wagner B. Complicated grief after perinatal loss. Dialogues Clin Neurosci. 2012;14(2):187-94.

(6) Luo ZC, Senecal S, Simonet F, Guimond E, Penney C, Wilkins R. Birth outcomes in the Inuit-inhabited areas of Canada. CMAJ. 2010 Feb 23;182(3):235-42.

(7) Luo Z, Wilkins R, Platt RW, Kramer MS. Risks of adverse pregnancy outcomes among Inuit and North American Indian women in Quebec, 1985–97. Paediatr Perinat Epidemiol. 2004;18(1):40-50.

(8) Arbour L, Gilpin C, Millor-Roy V, Platt R, Pekeles G, Egeland G, et al. Heart defects and other malformations in the Inuit in Canada: A baseline study. Int J Circumpolar Health. 2004 Sept;63(3):251-66.

(9) Smylie J, Crengle S, Freemantle J, Taualii M. Indigenous Birth Outcomes in Australia, Canada, New Zealand and the United States – an Overview. Open Womens Health J. 2010 Feb(4):7-17.

(10) Luo ZC, Wilkins R, Kramer MS, Fetal and Infant Health Study Group of the Canadian Perinatal Surveillance System. Effect of neighbourhood income and maternal education on birth outcomes: a population-based study. CMAJ. 2006 May 9;174(10):1415-20.

(11) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(12) Pampalon R, Hamel D, Gamache P, Raymond G. A deprivation index for health planning in Canada. Chronic Dis Can. 2009;29(4):178-91.

(13) Joseph KS, Liu S, Rouleau J, Lisonkova S, Hutcheon JA, Sauve R, et al. Influence of definition based versus pragmatic birth registration on international comparisons of perinatal and infant mortality: population based retrospective study. BMJ. 2012 Feb 17;344:e746.

(14) Deb-Rinker P, León J, Gilbert N, Rouleau J, Andersen A, Bjarnadóttir R, et al. Differences in perinatal and infant mortality in high-income countries: artifacts of birth registration or evidence of true differences? BMC Pediatr. 2015 Sept;4(15):112.

(15) Chen J, Fair M, Wilkins R, Cyr M. Maternal education and fetal and infant mortality in Quebec. Fetal and Infant Mortality Study Group of the Canadian Perinatal Surveillance System. Health Rep. 1998 Autumn;10(2):53,64 (Eng); 57-70 (Fre).

(16) Luo ZC, Wilkins R, Heaman M, Martens P, Smylie J, Hart L, et al. Neighborhood Socioeconomic Characteristics, Birth Outcomes and Infant Mortality among First Nations and Non-First Nations in Manitoba, Canada. Open Womens Health J. 2010;4:55-61.

(17) Pongou R. Why is infant mortality higher in boys than in girls? A new hypothesis based on preconception environment and evidence from a large sample of twins. Demography. 2013;50(2):421-44.

(18) Graafmans W, Richardus J, Macfarlane A, Rebagliato M, Blondel B, Verloove-Vanhorick S. Comparability of published parinatal mortality rates in Western Europe: The quantitative impacts of differences in gestitational age and birthweight criteria. BJOG. 2001 Dec;108(12):1237-45.

(19) Kramer M, Platt R, Yang H, Haglund B, Cnattinguis S, Bergsjo P. Registration artifacts in international comparisons of infant mortality. Paediatr Perin Epi. 2002 Jan;16(1):16-22.

(20) World Health Organization . ICD-10: International Statistical Classification of Diseases and Related Health Problems - Instruction Manual [Internet]. Geneva: WHO; 2004 [cited 2017 Jun 22]. Available from: www.who.int/classifications/icd/icdonlineversions/en/index.html.

(21) Allan B, Smylie J. First Peoples, second class treatment: The role of racism in the health and well-being of Indigenous peoples in Canada.: Wellesley Institute; 2015.

(22) Gilbert NL, Auger N, Tjepkema M. Stillbirth and infant mortality in Aboriginal communities in Quebec. Health reports. 2015;26(2):3.

(23) Centers for Disease Control and Prevention (CDC). Infant mortality and low birth weight among black and white infants--United States, 1980-2000. MMWR. 2002 Jul 12;51(27):589-92.

(24) Berthelot J, Wilkins R, Ng E. Trends in mortality by neighbourhood income in urban Canada from 1971 to 1996 [Canadian Community Health Survey-2002 Annual Report]. Health Reports. 2002;13:45.

(25) Wilkins R, Houle C, Berthelot J- and Ross D. The changing health status of Canada's children. ISUMA; 2000 .

(26) Kramer MS. Determinants of low birth weight: methodological assessment and meta-analysis. Bull World Health Organ. 1987;65(5):663-737.

(27) Kim D, Saada A. The Social Determinants of Infant Mortality and Birth Outcomes in Western Developed Nations: A cross-Country Systematic Review. Int J Environ Res Public Health. 2013 Feb;10(3):2296-335.

INEQUALITIES IN
UNINTENTIONAL INJURY MORTALITY IN CANADA

INEQUALITIES HIGHLIGHTS

- Individuals living in areas with a high concentration of First Nations, Inuit, and Métis people had, respectively, 3.5, 3.2, and 2.7 times the rate of unintentional injury mortality as those living in areas with a low concentration of First Nations, Inuit, and Métis people. This represents 74.8, 66.4, and 50.7 more deaths by unintentional injury per 100 000 people, respectively.
- The mortality rate from unintentional injury is 1.9 times higher among men than women. This means there are 19.5 more deaths by unintentional injury per 100 000 people.
- Unintentional injury mortality rates are 1.9 times higher in remote areas than in large urban centres (other than Toronto, Montréal, or Vancouver). This corresponds to 25.8 more deaths by unintentional injury per 100 000 people. These inequalities are more pronounced among men than women.
- Socioeconomic factors such as low income and educational levels are associated with higher rates of death from unintentional injury. Among Canadians living in the most materially deprived areas, the rates of unintentional injury mortality are 1.6 times higher than among Canadians living in the least materially deprived areas. This means there are 14.4 more deaths by unintentional injury per 100 000 people in the most materially deprived areas.

ACRONYM	FULL NAME
CI	Confidence Interval
DA	Dissemination area

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Unintentional injury is a serious public health concern that the Canadian Paediatric Society (1) and others have described as an "invisible epidemic." It is the leading cause of death among Canadian children and young adults (2). In 2013, unintentional injury ranked fifth among causes of death for all ages (3) and was among the leading causes of potential years of life lost (2)

In 2010, the three leading causes of deaths due to unintentional injury in Canada were falls (26%), transportation incidents (17%), of which the majority were motor vehicle collisions, and accidental poisonings, including drug overdoses (10%) (4). Death from unintentional injuries also included those resulting from pedestrian accidents, suffocation, drowning, and fire/burns. The three leading causes of injury-related deaths among children and youth were motor vehicle collisions (17%), drownings (15%), and breathing obstructions (11%). The total economic cost of unintentional injuries in Canada in 2010, including health care costs from injuries and lost productivity due to hospitalization, disability, and premature death, has been estimated at $22.1 billion (4).

Unintentional injury mortality is influenced by behavioural, psychosocial, environmental, and structural factors. For example, risk-taking behaviours are a contributing factor in fatal motor vehicle injuries (5), especially among young men. Masculine socialization may predispose men and boys to excessive risk-taking (5,6), and fatal occupational injuries occur almost exclusively among men (7). Psychosocial factors in the workplace, such as employee alienation, job control, and work strain, also contribute to occupational injuries (8).

Environmental factors also shape people's exposure to physical risks, potentially harmful social norms, and access to services and resources (9-11). Deteriorating streets and sidewalks, poor access to safe green space (12,13), social isolation, and norms regarding risky behaviours such as seat belt use and substance abuse (14,15) can all increase injury risk (16).

How socioeconomic and structural determinants influence the risk of injury is complex. For example, income and material resources affect the availability of safe, high quality housing and appropriate protective devices at work (8,17-19). For seniors, income, social supports, quality of housing, and access to services and assistive devices affect the risk of falls (20). Low income is associated with mortality as a result of fires, burns or poisoning; having no occupation is associated with increased risk of falls, poisoning, and suffocation (21).

In this context, unintentional injury mortality was selected as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter.)

METHODS

Data for mortality rates from unintentional injuries per 100 000 population were drawn from the Statistics Canada Vital Statistics Death Database for the years 2009 to 2011 for all ages. Data used in the analysis include injuries from causes such as motor vehicle collisions, falls, drownings, burns, and poisonings but exclude medical complications. Data are age-standardized using the 2011 Canadian Census of Population.

Few individual-level demographic and socioeconomic details are available from administrative data sources. Area-based measures were derived at the dissemination area (DA) level, using data from the 2006 Canadian Census of Population, to provide measures of inequality across social stratifiers. Consequently, these findings apply to the level of the dissemination area, not to the individual level.

Inequalities in unintentional injury mortality were assessed by age and sex/gender and by 6 area-based social stratifiers: income, education (ages 20+ years), immigrant status, Indigenous identity (First Nations, Inuit, or Métis), rural/urban residence, and social and material deprivation.

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported along with their 95% confidence intervals (CI). Statistical significance was assessed using 95% confidence intervals (22). Sex/gender-specific inequalities for the area-based measures were reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable fraction, population attributable rate, and population impact number.

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in Canada. (For more detailed information, see the Methodology chapter.)

FINDINGS

The unintentional injury mortality rate in Canada from 2009 to 2011 was 30.3 (95% CI: 29.9–30.6) per 100 000 people. Statistically significant inequalities in unintentional injury mortality were observed for all social stratifiers (Annex 1). (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Age

Nationally, the unintentional injury mortality rate increased with age, from 3.3 (95% CI: 3.0–3.6) per 100 000 children aged 0 to 11 years, to 19.6 (95% CI: 19.0–20.2) per 100 000 adults aged 35 to 49 years, to 300.2 (95% CI: 294.9–305.6) per 100 000 adults aged 80 years and over. This increasing trend was seen for both women and men, although rates were consistently higher among men. For example, the rate among men aged 18 to 34 years was 3.4 times the rate among women in the same age group—29.6 (95% CI: 28.6–30.6) versus 8.7 (95% CI: 8.2–9.3) per 100 000.

Sex/Gender

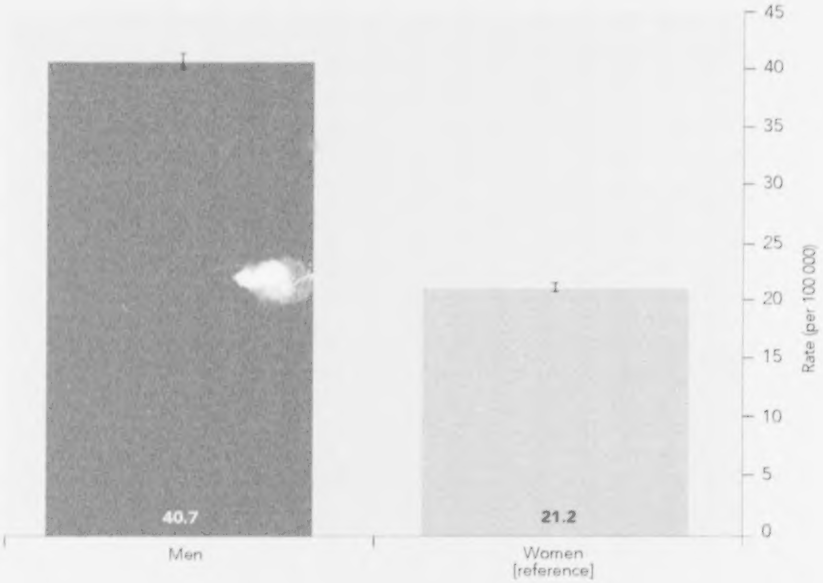
The unintentional injury mortality rate was 1.9 (95% CI: 1.9–2.0) times higher for men than for women. This represents 40.7 (95% CI: 40.1–41.3) per 100 000 men compared with 21.2 (95% CI: 20.8–21.5) per 100 000 women (Figure 1).

If men had the same unintentional injury mortality rates as women, there would be a 47.9% reduction in unintentional injury mortality among men and, potentially, 2 873 fewer unintentional injury-related deaths per year in Canada.

If men had the same unintentional injury mortality rates as women, there would potentially be 2 873 fewer unintentional injury-related deaths per year.

FIGURE 1

Unintentional Injury Mortality by Sex/Gender, Canada, 2009–2011



	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
Men	1.9*	19.5*	47.9*	28.0*	8.6*	2 873*
Women [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

Indigenous Peoples

The inequalities in unintentional injury mortality varied between areas with different predominant Indigenous identity groups. Individuals living in areas with a high concentration of First Nations, Inuit, and Métis had rates of unintentional injury mortality that were, respectively, 3.5, 3.2, and 2.7 times the rates of those living in areas with low concentrations of First Nations, Inuit, and Métis people. This means that in areas with a high concentration of First Nations people, there were 74.8 more cases per 100 000 people of unintentional injury deaths than in areas with a low concentration. Similarly, there were 66.4 and 50.7 more cases per 100 000 people for areas with high concentration of Inuit and Métis people, respectively (Figure 2).

Immigrant Status

Among people living in areas with a low proportion of foreign-born residents, the rate of unintentional injury mortality was 1.5 (95% CI: 1.5–1.6) times the rate among people living in areas of high proportion of foreign-born residents: 33.1 (95% CI: 32.7–33.6) per 100 000 in the former versus 21.6 (95% CI: 20.7–22.5) per 100 000 in the latter.

If rates among those living in areas with a low proportion of foreign-born residents were the same as for those living in areas with high proportion of foreign-born residents, there would be a 26.9% (95% CI: 24.7–29.3) reduction in the overall national rate. This means there would be 2 675 (95% CI: 2 389–2 985) fewer deaths by unintentional injury per year in Canada (Annex 1).

Inequalities in unintentional injury mortality by immigrant status differed for men and women. Among women and girls living in areas with a low proportion of foreign-born residents, the rate of unintentional injury mortality was 1.4 (95% CI: 1.3–1.5) times that of women and girls living in areas with a high proportion of foreign-born residents. Among men and boys, the rate was 1.6 (95% CI: 1.5–1.7) times higher in areas with a high proportion of Canadian-born males compared with areas with high proportion of foreign-born residents (Annex 1).

Income

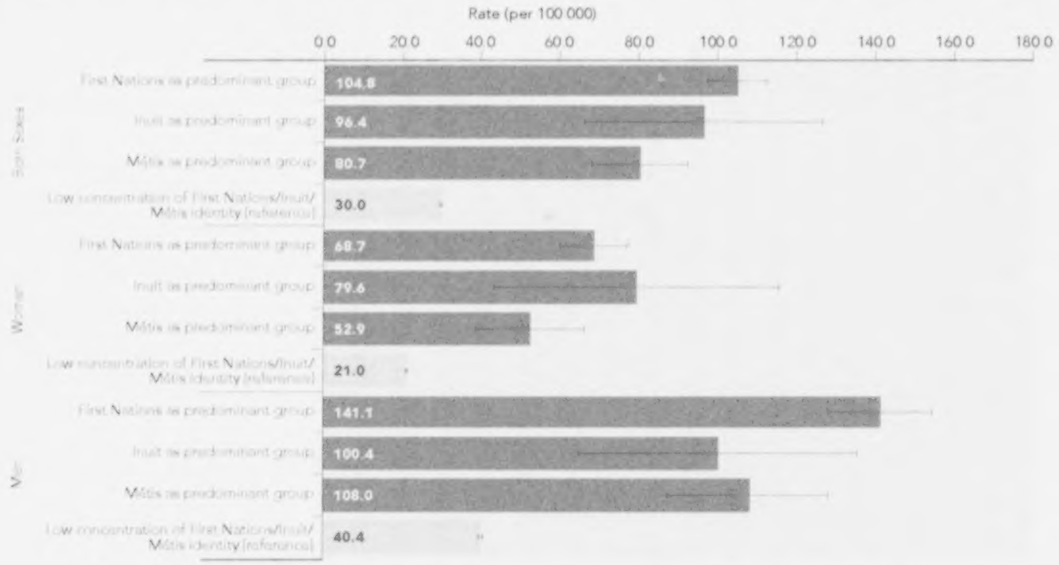
The unintentional injury mortality rate was inversely related to income. People living in areas with the lowest incomes were 1.4 (95% CI: 1.3–1.4) times more likely to die from unintentional injury than those living in areas with the highest incomes—37.6 (95% CI: 36.8–38.5) versus 27.1 (95% CI: 26.3–27.8) per 100 000.

If the rate in these two groups was the same, there would be a 27.9% (95% CI: 25.3–30.5) reduction in the prevalence of unintentional injury mortality among those living in areas with the lowest incomes and a 6.9% (95% CI: 6.1–7.6) reduction in the overall national rate. This would, hypothetically, result in 696 (95% CI: 603–791) fewer injury-related deaths a year (Annex 1).

Inequalities in unintentional injury mortality rates between the lowest and highest income areas also differed by sex/gender. Women living in the lowest income areas had an unintentional injury mortality rate that was 1.3 (95% CI: 1.3–1.4) times the rate among women living in the highest income areas. In contrast, among men living in the lowest income areas, the unintentional injury mortality rate was 1.5 (95% CI: 1.4–1.5) times that of men living in the highest income areas.

FIGURE 2

Unintentional Injury Mortality by Indigenous Identity and Sex/Gender, Canada, 2009–2011



BOTH SEXES	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
First Nations as predominant group	3.5*	74.8*	71.4*	2.0*	0.6*	209*
Inuit as predominant group	3.2*	66.4*	68.9*	0.2*	0.1*	23*
Métis as predominant group	2.7*	50.7*	62.8*	0.3*	0.1*	35*
Low concentration of First Nations/ Inuit/Métis identity [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
First Nations as predominant group	3.3*	47.7*	69.4*	1.6*	0.4*	68*
Inuit as predominant group	3.8*	58.6*	73.6*	0.2*	0.1*	9*
Métis as predominant group	2.5*	31.9*	60.3*	0.3*	0.1*	12*
Low concentration of First Nations/ Inuit/Métis identity [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
First Nations as predominant group	3.5*	100.7*	71.4*	2.3*	0.9*	139*
Inuit as predominant group	2.5*	60.0*	59.8*	0.2*	0.1*	13*
Métis as predominant group	2.7*	67.6*	62.6*	0.4*	0.1*	23*
Low concentration of First Nations/ Inuit/Métis identity [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Area-level measures of Indigenous identity derived from the 2006 Census of Population.
Predominant group: ≥ 33% of residents in dissemination area report Indigenous identity with majority belonging to indicated group
Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

Education (ages 20+ years)

Similar to income, the unintentional injury mortality rate was inversely related to educational status. People living in areas with the lowest educational status had rates of unintentional injury mortality that were 1.5 (95% CI: 1.5–1.6) times that of people living in areas with the highest educational status—37.9 (95% CI: 37.0–38.7) versus 24.8 (95% CI: 24.1–25.4) per 100 000 (Annex 1).

If the rate in these two groups was the same, there would be an 8.4% (95% CI: 7.8–9.1) reduction in the overall national rate of unintentional injury. This means there would be 862 (95% CI: 773–953) fewer injury deaths per year.

This inequality by education was more pronounced among men. The rate of unintentional injury mortality among men in the areas with the lowest educational status was 1.6 (95% CI: 1.6–1.7) times the rate among men in the areas with the highest educational status. Among women, this injury mortality inequality relative rate was 1.3 (95% CI: 1.3–1.4) times that of women in the areas with the lowest educational status.

Material and Social Deprivation

Among people living in the most materially deprived areas[17], the unintentional injury mortality rate was 1.6 (95% CI: 1.6–1.7) times the rate among people living in the least materially deprived areas (Figure 3).

If people living in the most materially deprived areas experienced the same rate as those living in the least materially deprived areas, there would be a 38.0% (95% CI: 35.5–40.4%) reduction in the rate of unintentional injury mortality among Canadians living in the most materially deprived areas. This would result in a 9.2% (95% CI: 8.4–9.9%) reduction in the overall national rate, which would equate to 835 (95% CI: 750–923) fewer injury deaths a year.

> If the rate in the most deprived area was as low as that in the least deprived area, there would be a 9.2% reduction in the national unintentional injury mortality rate.

People living in the most socially deprived areas had rates of unintentional injury mortality 1.2 (95% CI: 1.2–1.3) times the rate of those in the least socially deprived areas—33.8 (95% CI: (33.0–34.6) versus 27.9 (95% CI: 27.0–28.9) per 100 000.

If those living in the most socially deprived areas had the same injury mortality rate as those in the least deprived group, there would be a 17.5% (95% CI: 14.0–20.8) rate reduction for the less advantaged group. This would, potentially, represent a 4.5% (95% CI: 3.5–5.4) reduction in the overall national rate, equal to 406 (95% CI: 305–511) fewer injury-related deaths a year.

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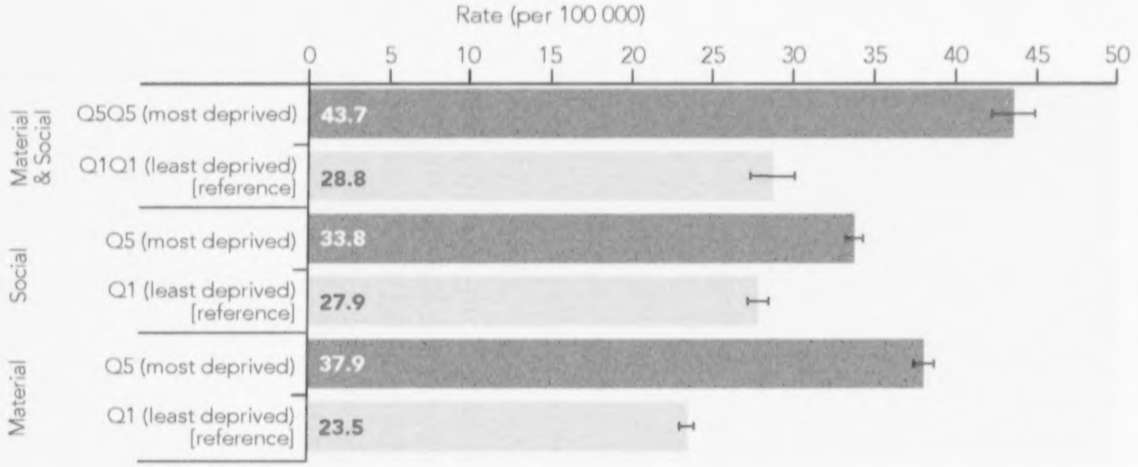
[17] For a definition of the deprivation index, see the Methodology chapter.

FIGURE 3

Unintentional Injury Mortality by Deprivation Index, Canada, 2009–2011



	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
DEPRIVATION INDEX (MATERIAL AND SOCIAL)						
Q5Q5 (most deprived)	1.5*	14.9*	34.1*	2.1*	0.6*	188*
Q1Q1 (least deprived) [reference]	1.0	0.0	0.0	0.0	0.0	0
DEPRIVATION INDEX (SOCIAL)						
Q5 (most deprived)	1.2*	5.9*	17.5*	4.5*	1.3*	406*
Q1 (least deprived) [reference]	1.0	0.0	0.0	0.0	0.0	0
DEPRIVATION INDEX (MATERIAL)						
Q5 (most deprived)	1.6*	14.4*	38.0*	9.2*	2.6*	835*
Q1 (least deprived) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Area level measures of deprivation index derived from the 2006 Census of Population.
Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

Rural/Urban Residence

The unintentional injury mortality rate in remote areas[18] (population <10 000) was 1.9 (95% CI: 1.8–2.0) times the rate in large urban centres (excluding Toronto, Montréal, or Vancouver) (Figure 4).

If the rate for these two groups was the same, there would be a 46.7% reduction in the rate of unintentional injury mortality for those living in remote areas and a 4.7% (95% CI: 4.4–5.1%) reduction in the overall national rate. This would be equal to 489 (95% CI: 437–536) fewer deaths a year. Moreover, Canadians living in the Montréal, Toronto, and Vancouver metropolitan areas had injury mortality rates that were 0.8 (95% CI: 0.8–0.8) times lower than in the other large Canadian cities. The unintentional injury mortality rate in Montréal, Toronto, and Vancouver was 6.1 (95% CI: 5.3–6.9) per 100 000 lower than in other large urban centres.

If the rates for remote areas were as low as for large urban centres, there would be a 46.7% reduction in the unintentional injury mortality rate among those living in remote areas.

Once again, inequalities differed by sex/gender. In remote areas, the unintentional injury mortality rate among men was 76.5 (95% CI: 73.1–80.0) per 100 000 people. This represents 1.9 (95% CI: 1.8–2.0) times the rate for men living in large urban centres (excluding Toronto, Montréal, or Vancouver). Women living in remote areas had unintentional injury deaths at a rate of 35.3 (95% CI: 33.3–37.5) per 100 000 people—1.7 (95% CI: 1.6–1.8) times the rate for women living in large urban centres (excluding Toronto, Montréal, or Vancouver).

DATA GAPS/LIMITATIONS

Death registration data rely on the judgment of medical examiners and coroners. Unintentional injury may not cause death immediately, but may contribute to death later. Because secondary causes of death are not coded, this may result in an underestimation of the unintentional injury mortality burden (23).

The measures used in this report quantify the inequalities experienced by specifically defined social groups. The inequalities facing individuals and communities who hold multiple and intersecting identities are not captured here.

Area-based measures used to define social groups are aggregated at the dissemination area level. Given that this relies on the assumption that sociodemographic and socioeconomic groups are uniform, there is a potential for misclassification bias and the underestimation of inequalities. Although the directions of disparities are the same in studies that use area-based measures versus those that use individual measures, the disparities vary and are much larger when measured at the individual level (24). (For more information on area-based measures, see the Methodology chapter.) Another limitation was that other stratifiers used for other health inequality measures, such as cultural/racial background, sexual orientation, and functional activity limitations, were unavailable.

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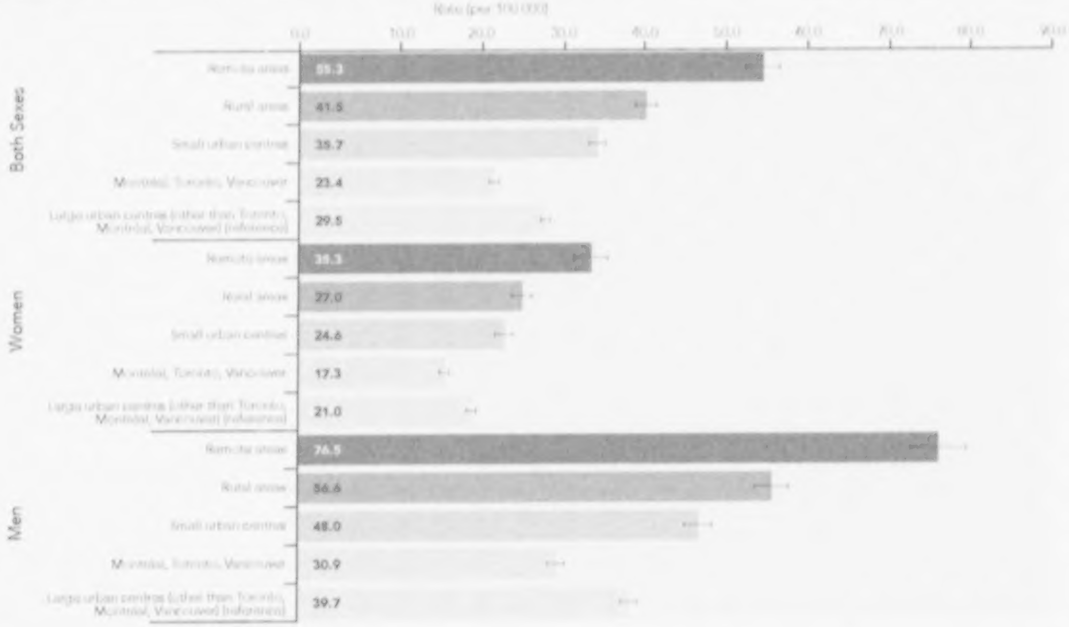
[18] For definitions of rural/urban subgroups, see the Methodology chapter.

FIGURE 4

Unintentional Injury Mortality by Rural/Urban Residence and Sex/Gender, Canada, 2009–2011



BOTH SEXES	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
Remote areas	1.9*	25.8*	46.7*	4.7*	1.5*	486*
Rural areas	1.4*	12.0*	28.9*	4.6*	1.4*	469*
Small urban centres	1.2*	6.2*	17.4*	2.8*	0.9*	285*
Montréal, Toronto, Vancouver	0.8*	−6.1*	NA	NA	NA	NA
Large urban centres (other than Toronto, Montréal, Vancouver) [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Remote areas	1.7*	14.3*	40.5*	3.7*	0.9*	157*
Rural areas	1.3*	6.0*	22.2*	3.2*	0.8*	136*
Small urban centres	1.2*	3.6*	14.6*	2.4*	0.6*	101*
Montréal, Toronto, Vancouver	0.8*	−3.7*	NA	NA	NA	NA
Large urban centres (other than Toronto, Montréal, Vancouver) [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Remote areas	1.9*	36.8*	48.1*	5.3*	2.0*	316*
Rural areas	1.4*	16.9*	29.9*	5.0*	1.9*	302*
Small urban centres	1.2*	8.3*	17.3*	2.8*	1.0*	165*
Montréal, Toronto, Vancouver	0.8*	−8.8*	NA	NA	NA	NA
Large urban centres (other than Toronto, Montréal, Vancouver) [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
* Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (22), calculating *p*-values would confirm statistically significant differences.

The data presented are cross-sectional in nature and highlight the distribution of health across different population groups in Canada. The measures of inequality discussed do not imply a causal relationship between the social stratifiers and the unintentional injury mortality rates. Instead, they capture the depth and impact of inequalities in unintentional injury mortality prevalence on different socially stratified groups. The disproportionate burden of unintentional injury mortality experienced by these groups is driven by a complex system of social and structural drivers of health that remains to be fully explored and understood.

DISCUSSION

Significant inequalities in unintentional injury mortality exist in Canada. The unintentional injury mortality rate among men was almost twice that of women. This difference may be due in part to greater risk-taking behaviours among men (25)—potentially contributing as well to the observed higher prevalence of motor vehicle collisions among men (23)—and to the fact that, on average, men drive longer distances than women (26). In 2015, of 852 occupational fatalities noted by the Association of Workers Compensation Boards of Canada, 95% were among males—reflecting, in part, differences in occupation, with a higher proportion of men working in trades, transport, and equipment operation (7).

Similar to our findings, immigrant populations in the United States of America have lower rates of mortality from unintentional injuries (27). Lower rates of injuries among immigrants may be partly explained by their less frequent participation in risk-taking behaviours, such as impaired driving, compared with non-immigrant populations (28). In addition, most immigrants live in Canada's large urban centres (29), where observed rates of unintentional injury mortality are lower compared to rural areas.

Unintentional injury mortality rates were considerably higher in areas with a high concentration of First Nations, Inuit, or Métis people. The relative risk for unintentional injury hospitalization was also greater in these areas, even after adjusting for socioeconomic status and rural/urban geography (30). Similarly, Indigenous people in Australia are almost three times as likely to die from road traffic injury compared to non-Indigenous Australians (31).

Stepwise gradients of inequality exist for levels of income and education. Low income has been associated with greater risk of injury for most injury causes, with deaths due to fire/burns up to 3 times more prevalent in the two lowest income quintiles (21). Housing characteristics such as inadequate lighting, insecure carpeting, and poorly designed stairs have been linked to injuries from falls (32). Limited access to safety devices among low-income people has also been linked to an increased risk for injury (21,33).

Similar associations can also be made between low educational status and elevated risk of mortality from all-cause unintentional injury and motor vehicle collisions (for males only), and from poisonings and drownings (both sexes) (21). This inequality may be due to restricted access to health information on, for example, safety equipment and protective devices or to fewer opportunities such as desirable and safe employment (34).

Greater material and social deprivation was associated with higher rates of unintentional injury mortality. Similarly, an inverse relationship was found between neighbourhood socioeconomic status and rates of severe injury among adults in Greater Vancouver, with the strongest association in the most socioeconomically deprived neighbourhoods. This finding suggests that efforts to reduce severe injuries should target these neighbourhoods (35). A study of the distribution of transportation injury mortality in 9 European settings found that men over 30 years of age with a low educational status had higher death rates in all settings (20.5 per 100 000 people), compared with men with a high educational status (12.3 per 100 000). There were no significant differences between women with low and high educational status (36).

People living in remote areas had higher mortality rates than those living in cities, especially large urban centres such as Montréal, Toronto, and Vancouver. Rates of unintentional injury mortality due to motor vehicle collisions, drownings, and fire/burn injuries were higher in rural areas for both men and women (21). These inequalities may be due to decreased access to, and lower quality of, emergency medical care in rural areas (33). Urban and rural populations may also differ in behavioural norms related to, for example, impaired driving or the use of protective safety devices (37). Finally, the exposure to injury risk is higher for rural residents (21), who have to drive longer distances to access services, often in worse conditions (e.g. poorer road lighting) (37).

In Canada, injury claims the lives of more children than all other causes (4), and mortality due to unintentional injury is one of the leading causes of death across all age groups. People living in areas with a low proportion of foreign-born residents and in rural or remote communities are disproportionally affected by unintentional injury, as are those living in areas with a high concentration of Indigenous people. There is a clear socioeconomic gradient in unintentional injury, with rates increasing as income and education levels decrease and as social and material deprivation increases. Due to risk factors related to risk-taking behaviour, men are also more likely to die due to unintentional injury (5,25,28). Unintentional injury mortality is influenced by broader social, economic and environmental conditions, including income, housing, social supports, exposure to physical risks, social norms, and access to services. Policy interventions, along with systematic measurement and ongoing monitoring of the impact of these interventions on identified inequalities, will help inform and strengthen programs and research. By targeting both individual risk factors and the broader determinants of unintentional injury, across socio-demographic and socioeconomic groups, these approaches must aim to decrease both the inequalities and prevalence of unintentional injury mortality and its determinants over time and to benefit all Canadians.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Unintentional Injury Mortality.
Data Source: CMDB 2009–2011

SUMMARY MEASURES

POPULATION IMPACT MEASURES

NOTE

[illegible]

LEGEND

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References

(1) Yanchar NL, Warda, LJ, Fuselli, P, Canadian Pediatric Society and Injury Prevention Committee. [Internet]. Ottawa: Canadian Pediatric Society; 2012 Nov 2. Position statement - Child and youth injury prevention: A public health approach [updated 2016 Jun 20; cited 2017 Jul 31]; [about 11 screens]. Available from: http://www.cps.ca/documents/position/child-and-youth-injury-prevention.

(2) Statistics Canada. [Internet]. Ottawa: Statistics Canada; n.d.-b. Leading causes of death, total population, by age group and sex, Canada, annual, CANSIM (database) [updated 2017 Mar 09; cited 2017 Jul 31]; [about 5 screens]. Available from: http://www5.statcan.gc.ca/cansim/a26?lang=eng&id=1020561.

(3) Statistics Canada. [Internet]. Ottawa: Statistics Canada; n.d.-b. Table 102-4313: Mortality and potential years of life lost, by selected causes of death and sex, three-year average, Canada, provinces, territories, health regions and peer groups, occasional (number unless otherwise noted), CANSIM (database) [updated 2016 May 24; cited 2017 Jul 31]; [about 6 screens]. Available from: http://www5.statcan.gc.ca/cansim/a05?lang=eng&id=01024313.

(4) Parachute. The cost of injury in Canada [Internet]. Toronto: Parachute; 2015 [cited 2017 Jul 31]. Available from: http://www.parachutecanada.org/downloads/research/Cost_of_Injury-2015.pdf.

(5) Sorenson S. Gender Disparities in Injury Mortality: Consistent, Persistent, and Larger Than You'd Think. American Journal of Public Health. 2011;101(S1).

(6) Marini ID. Issues of males with physical disabilities in rehabilitation settings. In: Good GE, Brooks GR, editors. The new handbook of psychotherapy and counseling with men: A comprehensive guide to settings, problems, and treatment approaches, Rev San Francisco: Jossey-Bass; 2005. p. 88-102.

(7) Association of Worker's Compensation Boards of Canada. [Internet]. Toronto: AWCBC; 2015. 2015 injury statistics across Canada [updated 2015 cited 2017 Jul 31]; [about 5 screens]. Available from: http://awcbc.org/?page_id=14.

(8) Cubbin C, Smith GS. Socioeconomic inequalities in Injury: Critical issues in design and analysis. Annual Review of Public Health. 2002;23:349.

(9) Soubhi H, Raina P, Kohen D. Neighborhood, Family, and Child Predictors of Childhood Injury in Canada. Am J Health Beahvior. 2004;28(5):397.

(10) Gagné M, Hamel D. Deprivation and unintentional injury hospitalization in Quebec children. Chronic diseases in Canada. 2009;29(2):56.

(11) Diez Roux AV, Mair C. Neighborhoods and health. Ann N Y Acad Sci. 2010;1186(1):125-45.

(12) Subramanian S, Chen JT, Rehkopf DH, Waterman PD, Krieger N. Comparing individual-and area-based socioeconomic measures for the surveillance of health disparities: a multilevel analysis of Massachusetts births, 1989–1991. Am J Epidemiol. 2006;164(9):823-34.

(13) Kelly CM, Schootman M, Baker EA, Barnidge EK, Lemes A. The association of sidewalk walkability and physical disorder with area-level race and poverty. J Epidemiol Community Health. 2007 Nov;61(11):978-83.

(14) Taylor B, Irving HM, Room R, Borges G, Cherpitel CJ, Bond J, et al. The more you drink the harder you fall: A systemic review and meta-analysis of how acute alochol consumsption and injury or collision risk increase together. Drug Alcohol Dpeend. 2010;110(1-2):108.

(15) Williams CT, Latkin CA. Neighborhood socioeconomic status, personal network attributes, and use of heroin and cocaine. Am J Prev Med. 2007;32(6):S203-10.

(16) Karb RA, Subramanian S, Fleegler EW. County poverty concentration and disparities in unintentional injury deaths: a fourteen-year analysis of 1.6 million US fatalities. PLoS one. 2016;11(5):e0153516.

(17) Galobardes B, Lynch J, Smith GD. Measuring socioeconomic position in health research. Br Med Bull. 2007(1).

(18) Galobardes B, Smith GD, Lynch JW. Systematic review of the influence of childhood socioeconomic circumstances on risk for cardiovascular disease in adulthood. Ann Epidemiol. 2006;16(2):91-104.

(19) Phelan JC, Link BG, Tehranifar P. Social conditions as fundamental causes of health inequalities: theory, evidence, and policy implications. J Health Soc Behav. 2010;51(1_suppl):S28-40.

(20) Public Health Agency of Canada. Report on seniors' falls in Canada. Ottawa: Minister of Public Works and Government Services Canada; 2005 [cited 21 November, 2017].

(21) Burrows S, Auger N, Gamache P, Hamel D. Individual and area socioeconomic inequalities in cause-specific unintentional injury mortality: 11-Year follow-up study of 2.7 million Canadians. Accident Analysis & Prevention. 2012 3;45:99-106.

(22) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(23) Chen Y, Mo F, Li QL, Jiang Y, & Mao Y. Unintentional injury mortality and external casues in Canada from 2001 to 2007. Chronic Diseases and Injuries in Canada. 2013;33(2):95.

(24) Pampalon R, Hamel D, Gamache P. A comparison of individual and area-based socio-economic data for monitoring social inequalities in health. Health Reports. 2009;20(4):85.

(25) Williams DR. The health of men: structured inequalities and opportunities. Am J Public Health. 2008;98(Supplement_1):S150-7.

(26) Li G, Baker SP, Langlois JA, Kelen GD. Are female drivers safer? An application of the decomposition method. Epidemiology. 1998:379-84.

(27) Singh GK, Siahpush M. All-cause and cause-Specific mortality of immigrants and native born in the United States. American Journal of Public Health. 2001;91(3):392.

(28) Xiang H, Yu S, Zhang X, Scurlock C, Smith GA, Stallones L. Behavioral risk factors and unintentional injuries among US immigrant adults. Ann Epidemiol. 2007;17(11):889-98.

(29) Statistics Canada. Immigration and ethnocultural diversity in Canada. National Household Survey, 2011. Cat. No. 99-101010-X2011001. 2012. Ottawa: Ministry of Industry; 2013 [cited 21 November, 2017].

(30) Bougie E, Fines P, Oliver LN, Kohen DE. Unintentional injury hospitalizations and socio-economic status in areas with a high percentage of First Nations identity residents. Health reports. 2014;25(2):3.

(31) Falster MO, Randall DA, Lujic S, Ivers R, Leyland AH, Jorm LR. Disentangling the impacts of geography and Aboriginality on serious road transport injuries in New South Wales. Accident Analysis & Prevention. 2013;54:32-8.

(32) Canadian Institute for Health Information. Trends in income-related health inequalities in Canada: technical report: revised July 2016 [Internet]. Ottawa: Canadian Institute for Health Information; 2016 [cited 2017 Feb 15]. Available from: https://secure.cihi.ca/free_products/trends_in_income_related_inequalities_in_canada_2015_en.pdf.

(33) Laflamme L, Burrows S and Hasselberg M. Socioeconimic differences in injury risks: a review of findings and a discussion of potnetial countermeasures. Copenhagen: World Health Organization; 2009 [cited 2017 Jul 31].

(34) Zimmerman Emily B., Woolf Steven H. and Haley Amber. [Internet]. Rockville, MD: Agency for Healthcare Research and Quality; 2015. Understanding the relationship between education and health: A review of the evidence and examination of community perspectives [updated 2015 Sep; cited 2017]; [about 45 screens]. Available from: https://www.ahrq.gov/professionals/education/curriculum-tools/population-health/zimmerman.html.

(35) Lawson F, Schuurman N, Amram O, Nathens AB. A geospatial analysis of the relationship between neighbourhood socioeconomic status and adult severe injury in Greater Vancouver. Inj Prev. 2015 BMJ Publishing Group Ltd;21(4):260-5.

(36) Borrell C, Plasencia A, Huisman M, Costa G, Kunst A, Andersen O, et al. Education level inequalities and transportation injury mortality in the middle aged and elderly in European settings. Inj Prev. 2005 Jun;11(3):138-42.

(37) Kmet L, Brasher P, Macarthur C. A small area study of motor vehicle crash fatalities in Alberta, Canada. Accident Analysis & Prevention. 2003;35(2):177-82.

HEALTH OUTCOMES

MENTAL ILLNESS

INEQUALITIES IN
SUICIDE MORTALITY IN CANADA

INEQUALITIES HIGHLIGHTS

- There is a clear socioeconomic gradient for suicide, with suicide rates increasing as income and education levels decrease and as social and material deprivation increase.
- In areas where there are many people who identify as Inuit, First Nations, and Métis, the suicide rates are, respectively, 6.5, 3.7, and 2.7 times higher than areas with a low concentration of people who identify as Indigenous. This means there are, respectively, 61.0, 29.2, and 18.6 more deaths by suicide per 100 000 people.
- Suicide rates are particularly high among males who live in areas where many people identify as Inuit (118.2 per 100 000). This represents 100.9 more deaths by suicide per 100 000 people.
- The suicide rate among males is 3.3 times higher than the rate among females. This equates to 12.3 more deaths by suicide per 100 000 people. The rate is consistently higher across all social stratifiers.
- Suicide rates are highest among middle-aged adults.
- In the most materially *and* socially deprived areas, the suicide rate is 2.7 times the rate in the least deprived areas. This represents 13.5 more deaths by suicide per 100 000 people.
- The suicide rate in remote areas was 1.9 times the rate in large cities. This equates to 10.7 more deaths by suicide per 100 000 people.

ACRONYM	FULL NAME
CI	Confidence Interval
LGBT	Lesbian, Gay, Bisexual And Transgender
OECD	Organisation for Economic Co-operation and Development

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

On average, more than 10 Canadians die by suicide every day, with almost 4 000 suicide deaths in Canada per year (1). Suicide is the ninth leading cause of death overall and is the second leading cause of death among 15- to 34-year old Canadians (2).

Because mortality rates due to motor vehicle traffic collisions have declined while suicide death rates have changed little, suicide is also now the second leading cause of death among youth aged 15 to 24 years (3).

Suicide has a devastating impact on the families, friends, colleagues, and communities. For every death by suicide, it is estimated that at least 7 to 10 people are profoundly affected by the loss (4). Suicide also has a significant economic impact: the economic burden of self-inflicted injury was estimated at $2.96 billion in 2010 (5).

Suicide is a complex issue, with no single factor explaining or predicting suicide. Although suicide can affect anyone, some groups have greater rates of suicide than others. Individual, family, community, and societal factors all play a role in the risk for suicide attempts and deaths by suicide (6). Mental illness, substance use, and addictions are important risk factors for suicide (7). While most people who die by suicide had a mental illness (8), most people living with a mental illness will not die by suicide. Social determinants of health, including social identities (e.g. sex/gender, racial/cultural background, income), access to resources, family violence, interpersonal conflict, exposure to trauma, or lack of community connectedness are also risk factors (9). This is reflected in significant social inequalities in suicide in Canada.

As a result, suicide was selected as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter.)

METHODS

Suicide data were obtained from the Canadian Mortality Database (2009–2011) and are based on death certificate information. Few individual-level demographic and socioeconomic details are available from administrative data sources. Area-based measures were derived at the dissemination area level, using data from the 2006 Census, to provide measures of inequality across social stratifiers. Consequently, these findings apply to the level of the dissemination area and not the level of the individual. The analysis on suicide death included people of all ages and the rates were standardized by age using the 2011 Canadian Census of Population.

Inequalities in suicide rate were assessed by measuring differences according to social stratifiers grouped under the socioeconomic and sociodemographic stratifiers, age and sex/gender and by six area-based stratifiers (income, education, immigrant status, Indigenous identity, rural/urban residence, and social and material deprivation).

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported along with their 95% confidence intervals (CIs). Statistical significance was assessed using 95% confidence intervals (10). Sex/gender-specific inequalities for the area-based measures were reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities (rate ratio, rate difference, attributable fraction, population attributable rate, population attributable fraction, population impact number).

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in the Canadian context. (For more detailed information, see the Methodology chapter.)

FINDINGS

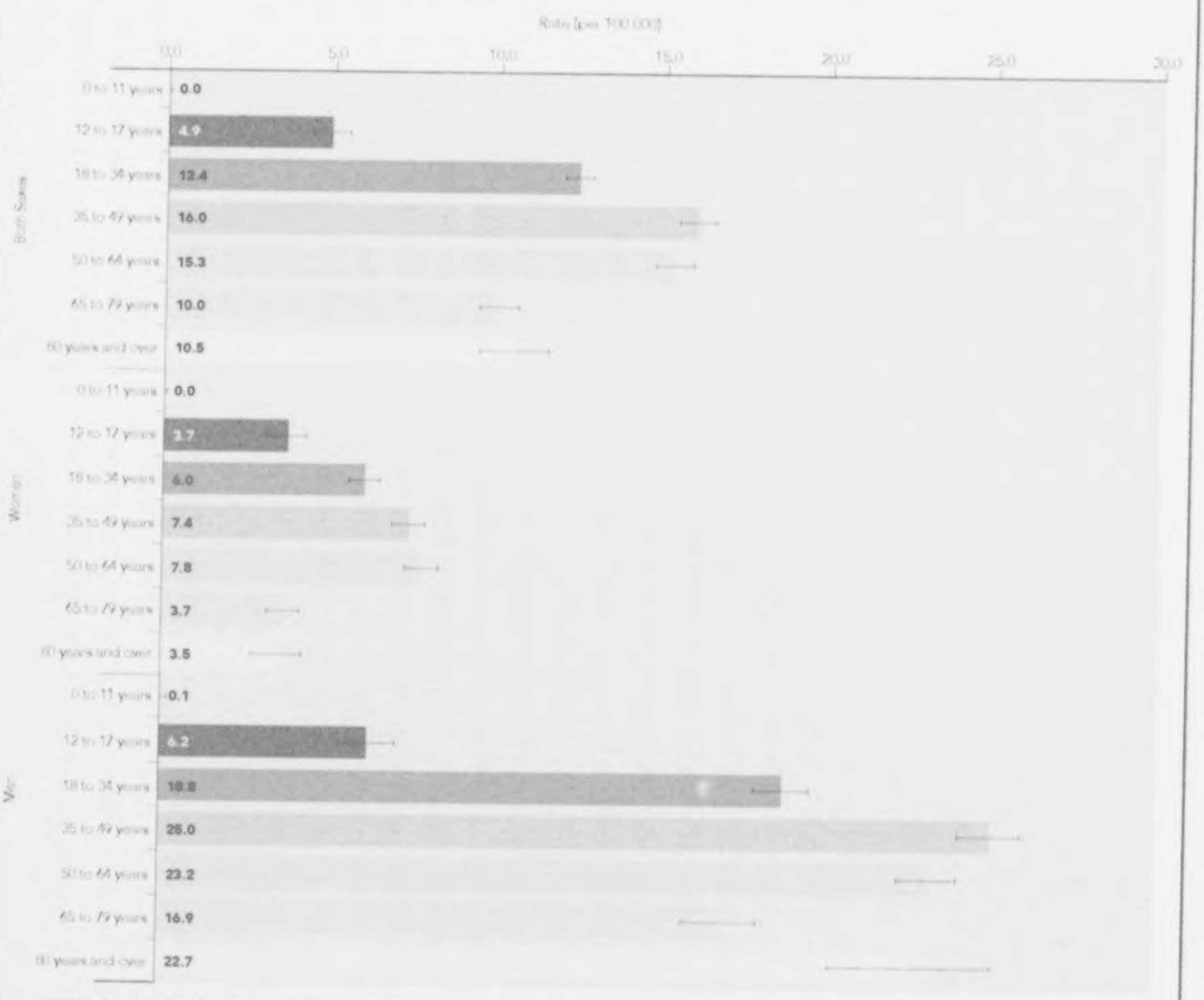
In 2009–2011, the rate of suicide death was 11.3 per 100 000 Canadians. There were significant inequalities in suicide deaths experienced by all social groups, described below. Across all social stratifiers, the rate of suicide is consistently higher for men than women. (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Age

Nationally, suicide rates by age varied significantly. Among 12- to 17-year-olds, the suicide rate was 4.9 (95% CI: 4.4–5.5) per 100 000. The rate increased to 12.4 (95% CI: 12.0–12.9) per 100 000 for 18- to 34-year-olds. Suicide rates were highest among 35- to 49-year-olds, at 16.0 (95% CI: 15.5–16.6) per 100 000 and among 50- to 64-year-olds, at 15.3 (95% CI: 14.8–15.9) per 100 000. Suicide rates declined among 65- to 79-year-olds, to 10.0 (95% CI: 9.4–10.6) per 100 000, and among people over 80 years old, to 10.5 (95% CI: 9.5–11.6) per 100 000 (Figure 1).

FIGURE 1

Suicide Deaths Rate by Age and Sex/Gender, Canada, 2009–2011



Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

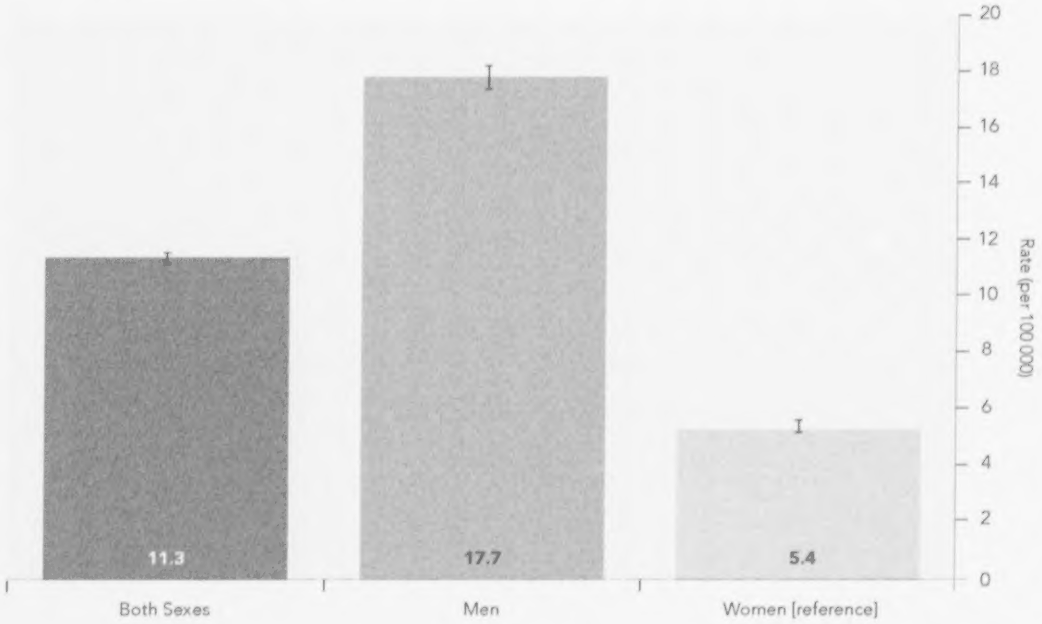
Sex/Gender

Since the suicide death rates are presented for all age groups, specific findings include the data for children, youth, and adults. The suicide rate among males was 3.3 (95% CI: 3.1–3.4) times the rate among females. The rate for males was 17.7 (95% CI: 17.3–18.1) per 100 000 compared with 5.4 (95% CI: 5.2–5.6) per 100 000 for females (Figure 2).

If the rates for males were the same as the rates for female, there would be 1 989 fewer suicide deaths in Canada each year.

FIGURE 2

Suicide Deaths Rate by Sex/Gender, Canada, 2009–2011



	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
Men	3.3*	12.3*	69.5*	52.6*	5.9*	1 989*
Women [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

Indigenous Peoples

Suicide rates in areas with a high concentration of Inuit, First Nations, and Métis people were higher than in areas with a low concentration of people identifying as Indigenous: 6.5 (95% CI: 5.5–7.8) times higher in areas with a high concentration of Inuit; 3.7 (95% CI: 3.3–4.0) times higher in areas with a high concentration of First Nations; and 2.7 (95% CI: 2.1–3.5) times higher in areas with a high concentration of Métis. This represents, respectively, 61, 29, and 19 more deaths by suicide per 100 000 people (Figure 3).

If the suicide rates in areas with a high concentration of people identifying as Inuit, First Nations, and Métis were the same as the rates among non-Indigenous people, suicide rates would be reduced by 84.7% (95% CI: 81.8–87.2) among Inuit, by 72.6% (95% CI: 69.8–75.2) among First Nations, and by 62.8% (95% CI: 52.3–71.1) among Métis.

Inequalities in suicide by Indigenous identity and sex/gender were most pronounced in areas with a higher concentration of Inuit. The suicide rate among Inuit males was 118.2 per 100 000—five times the rate among Inuit females, at 24.5 per 100 000 (Figure 3).

Immigrant Status

Suicide rates were 42.4% (95% CI: 38.0–46.5%) lower in areas with a high concentration of foreign-born residents compared with areas with a low concentration of foreign-born residents.

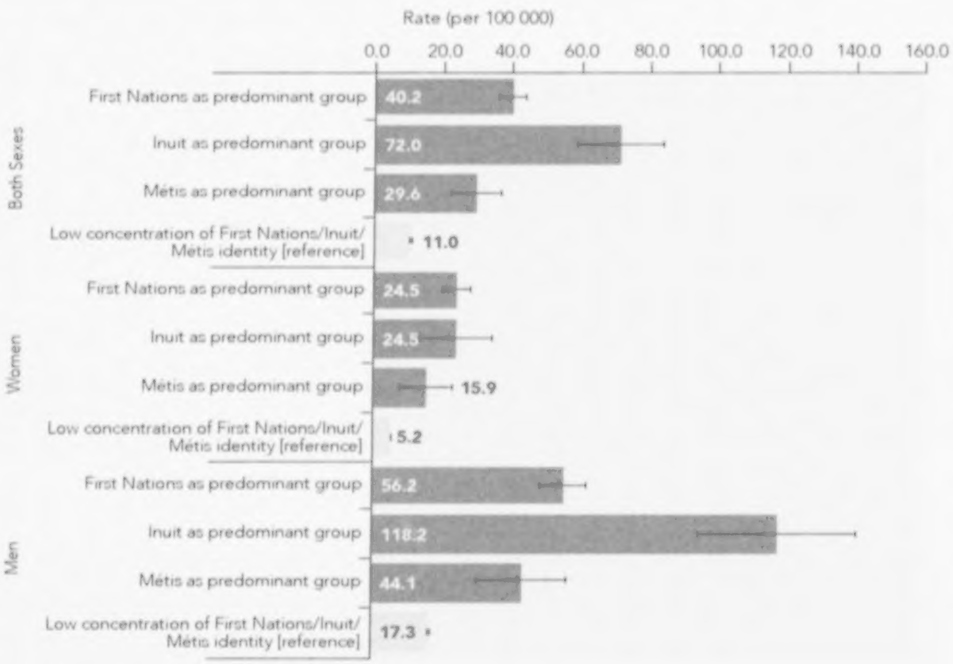
If the suicide rate in areas with a low concentration of foreign-born residents was the same as the rate in areas with a high concentration of foreign-born residents, there would be a 32.9% (95% CI: 29.5–36.5%) reduction in the national suicide rate. This would, hypothetically, result in 1 197 (95% CI: 1 034–1 375) fewer lives lost to suicide a year in Canada (Annex 1).

Income

The relationship between income and suicide rate was inverse—as income decreased, suicide rates increased, especially among males. In Canada, the suicide rate among people in the lowest income quintile was 15.9 (95% CI: 15.3–16.5) per 100 000. This was 1.8 times the rate among people in the highest income quintile. If the suicide rate among people in the lowest income quintile was the same as the rate among people in the highest income quintile, the suicide rate would be reduced by 44.0% (95% CI: 40.6–47.2%) among people in the lowest income quintile (Figure 4).

FIGURE 3

Suicide Deaths Rate by Indigenous Identity and Sex/Gender, Canada, 2009–2011

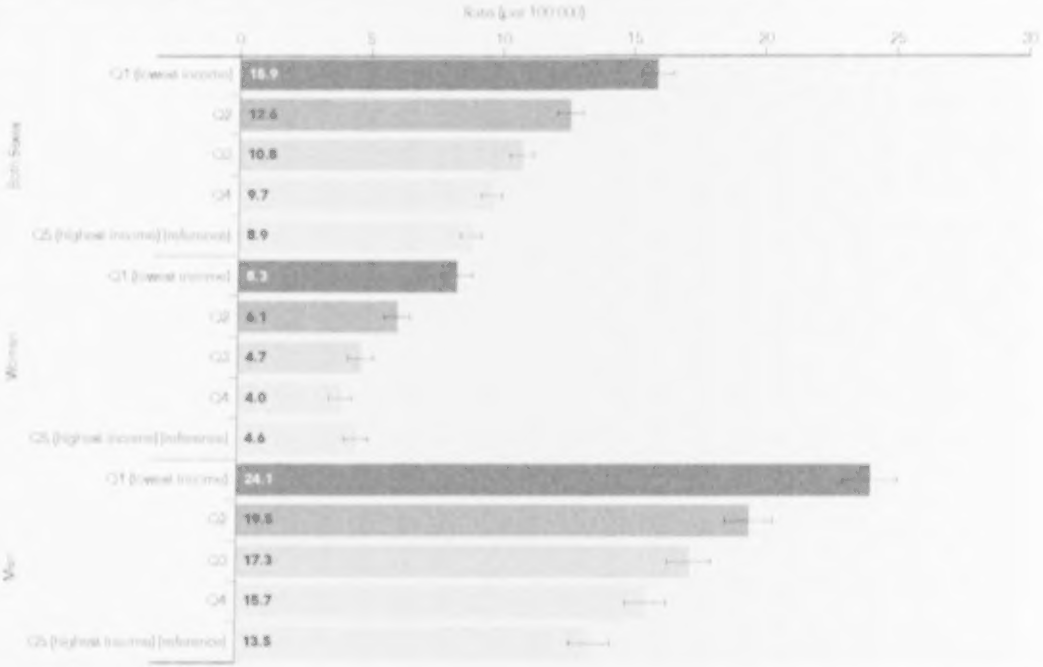


BOTH SEXES	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
First Nations as predominant group	3.7*	29.2*	72.6*	2.8*	0.3*	105*
Inuit as predominant group	6.5*	61.0*	84.7*	1.0*	0.1*	37*
Métis as predominant group	2.7*	18.6*	62.8*	0.3*	0.0*	13*
Low concentration of First Nations/ Inuit/Métis identity group [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
First Nations as predominant group	4.7*	19.3*	78.8*	4.1*	0.2*	38*
Inuit as predominant group	4.7*	19.3*	78.8*	0.7*	0.0*	7*
Métis as predominant group	3.1*	10.7*	67.3*	0.5*	0.0*	4*
Low concentration of First Nations/ Inuit/Métis identity group [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
First Nations as predominant group	3.2*	38.9*	69.2*	2.4*	0.4*	68*
Inuit as predominant group	6.8*	100.9*	85.4*	1.1*	0.2*	31*
Métis as predominant group	2.5*	26.8*	60.8*	0.3*	0.1*	9*
Low concentration of First Nations/ Inuit/Métis identity group [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Area-level measures of Indigenous identity derived from the 2006 Census of Population.
Predominant group: ≥ 33% of residents in dissemination area report Indigenous identity with majority belonging to indicated group.
Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

FIGURE 4

Suicide Deaths Rate by Income Quintile and Sex/Gender, Canada, 2009–2011



BOTH SEXES	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
Q1 (lowest income)	1.8*	7.0*	44.0*	11.5*	1.3*	431*
Q2	1.4*	3.7*	29.4*	6.3*	0.7*	237*
Q3	1.2*	1.9*	17.6*	3.4*	0.4*	126*
Q4	1.1*	0.8*	8.2*	1.4*	0.2*	54*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Q1 (lowest income)	1.8*	3.7*	44.6*	12.7*	0.7*	115*
Q2	1.3*	1.5*	24.6*	5.4*	0.3*	49*
Q3	1.0	0.1	2.1	0.4	0.0	3
Q4	0.9	–0.6	NA	NA	NA	NA
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Q1 (lowest income)	1.8*	10.6*	44.0*	11.2*	2.0*	317*
Q2	1.4*	6.0*	30.8*	6.6*	1.2*	188*
Q3	1.3*	3.8*	22.0*	4.3*	0.8*	123*
Q4	1.2*	2.2*	14.0*	2.6*	0.5*	73*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non applicable
Q: Quintile
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Area level measures of income quintiles derived from the 2006 Census of Population.
Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

Education

There was an inverse inequality gradient between education level and suicide rate, with the suicide rate increasing as education level decreased. Among people living in areas with the lowest levels of education, the suicide rate was 15.0 (95% CI: 14.4–15.5) per 100 000. This is 1.6 (95% CI: 1.5–1.7) times the rate among those living in areas with the highest levels of education.

If the suicide rate among people living in areas with the lowest levels of education was the same as among those living in areas with the highest levels of education, there would be 357 (95% CI: 299–417) fewer suicide deaths a year in Canada (Annex 1).

Material and Social Deprivation

There were clear inequality gradients between suicide and material and social deprivation[19], with suicide rates increasing as deprivation increased. Among people living in the most materially deprived areas—with the highest levels of people without a high school diploma, the highest unemployment rates, and lowest average incomes—the suicide rate was 14.8 (95% CI: 14.2–15.4) per 100 000. This rate was 1.6 (95% CI: 1.5–1.7) times the rate among those living in the least deprived areas.

If the suicide rate among people living in the most materially deprived areas was the same as the rate among people living in the least materially deprived areas, there would be a 39.2% (95% CI: 35.4–42.7%) reduction in the suicide rate among those living in the most materially deprived areas (Annex 1).

Similarly, among people living in the most socially deprived areas—with the highest concentrations of people living alone, single-parent families, and people who were separated, widowed, or divorced—the suicide rate was 15.2 (95% CI: 14.7–15.8) per 100 000. This was 1.7 (95% CI: 1.6–1.9) times the rate among people living in the least socially deprived areas. This inequality in suicide by social deprivation was more pronounced among males. While females in the most socially deprived and second most socially deprived areas had suicide rates of 8.3 (95% CI: 7.7–8.9) and 6.1 (95% CI: 5.6–6.6) per 100 000, males living in these areas had suicide rates of 23 (95% CI: 22–24) and 19 (95% CI: 18.1–19.9) per 100 000 (Annex 1).

In the most socially *and* materially deprived areas, the suicide rate was 21.3 (95% CI: 19.8–22.8) per 100 000. This represents 2.7 (95% CI: 2.4–3.1) times the rate in the least deprived areas (Figure 5).

Rural/Urban Residence

The highest rate of suicide, at 22.0 (95% CI: 20.8–23.4) per 100 000, was observed among people living in remote areas[20], and the lowest rate, at 8.8 (95% CI: 8.5–9.2) per 100 000, in Toronto, Montréal, and Vancouver. The rate of suicide among people living in Toronto, Montréal, and Vancouver was 0.8 (95% CI: 0.74–0.82) times the rate among people living in other large urban centres (other than Toronto, Montréal and Vancouver) (Figure 6).

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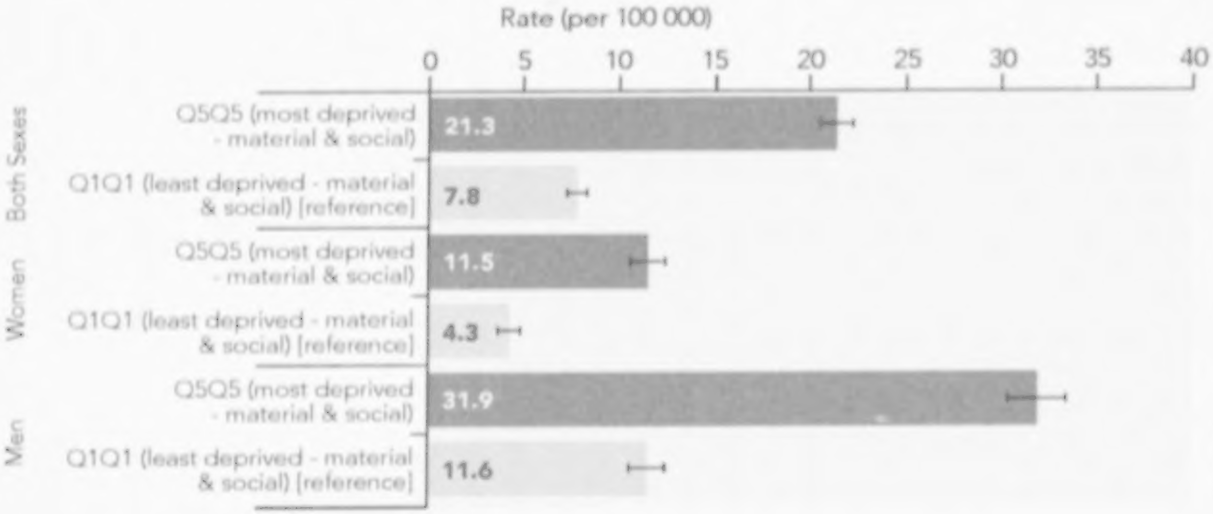
[19] For a definition of the deprivation index, see the Methodology chapter.

[20] For definitions of rural/urban subgroups, see the Methodology chapter.

FIGURE 5

Suicide Deaths Rate by Deprivation Index Quintiles and Sex/Gender, Canada, 2009–2011

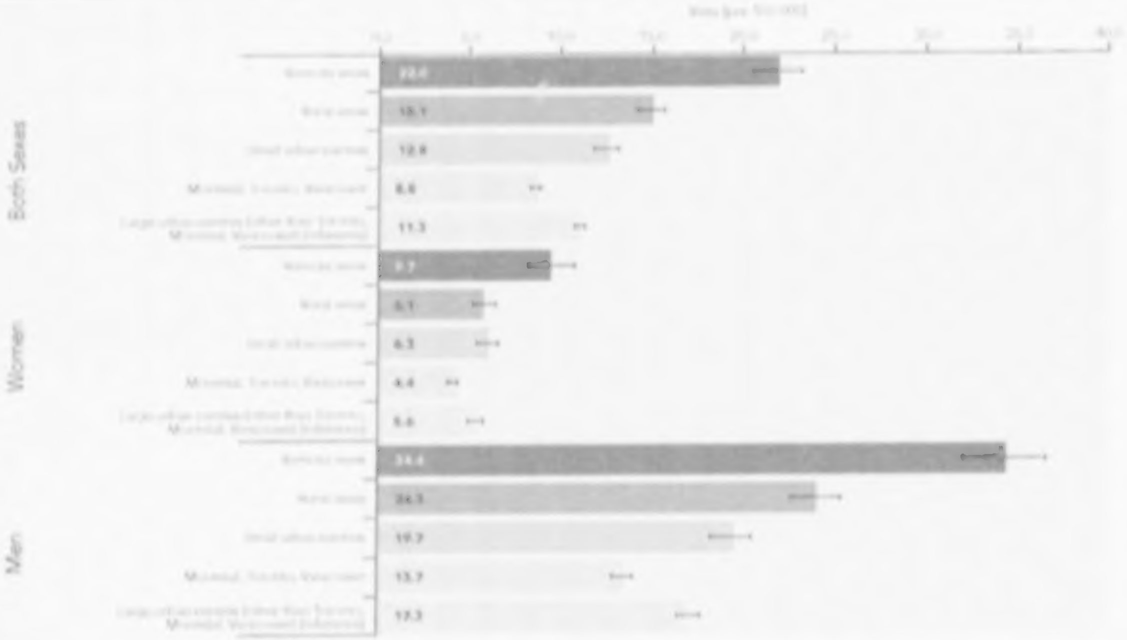


BOTH SEXES	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
Q5Q5 (most deprived—material & social)	2.7*	13.5*	63.4*	4.5*	0.5*	162*
Q1Q1 (least deprived—material & social) [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Q5Q5 (most deprived—material & social)	2.7*	7.2*	62.6*	5.0*	0.3*	44*
Q1Q1 (least deprived—material & social) [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Q5Q5 (most deprived—material & social)	2.8*	20.3*	63.6*	4.3*	0.7*	117*
Q1Q1 (least deprived—material & social) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Area level measures of deprivation index derived from the 2006 Census of Population.
Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011

FIGURE 6

Suicide Deaths Rate by Rural/Urban Residence and Sex/Gender, Canada, 2009–2011



BOTH SEXES	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
Remote areas	1.9*	10.7*	43.6*	4.9*	0.6*	186*
Rural areas	1.3*	3.8*	25.2*	3.8*	0.4*	143*
Small urban centres	1.1*	1.5*	11.7*	1.7*	0.2*	63*
Montréal, Toronto, Vancouver	0.8*	−2.5*	NA	NA	NA	NA
Large urban centres (other than Toronto, Montréal, Vancouver) (reference)	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Remote areas	1.7*	4.1*	42.3*	3.9*	0.2*	35*
Rural areas	1.1	0.5	8.2	1.0	0.1	10
Small urban centres	1.1*	0.7*	11.1*	1.6*	0.1	15
Montréal, Toronto, Vancouver	0.8*	−1.2*	NA	NA	NA	NA
Large urban centres (other than Toronto, Montréal, Vancouver) (reference)	1.0	0.0	0.0	0.0	0.0	0
MEN						
Remote areas	2.0*	17.3*	50.0*	5.2*	0.9*	150*
Rural areas	1.4*	7.0*	28.8*	4.6*	0.8*	131*
Small urban centres	1.1*	2.4*	12.2*	1.7*	0.3*	49*
Montréal, Toronto, Vancouver	0.8*	−3.6*	NA	NA	NA	NA
Large urban centres (other than Toronto, Montréal, Vancouver) (reference)	1.0	0.0	0.0	0.0	0.0	0

NA: Not applicable.
*: Significantly different from reference category.
Age standardization was performed using the 2011 Census of Population.
Source: Vital Statistics – Canadian Mortality Database (CMDB) 2009–2011.

FROM OTHER STUDIES: INEQUALITIES IN SUICIDE-RELATED BEHAVIOURS AND RATES BY ETHNICITY, DISABILITY, AND SEXUAL ORIENTATION

- Because data on ethnicity, disability, and lesbian/gay/bisexual/transgender (LGBT) identities are not available in the Canadian Vital Statistics Death Database, suicide rates could not be stratified by these variables.
- A meta-analysis of 25 international population-based studies showed that suicide attempts among gay and bisexual men are 4 times more frequent than among heterosexual men; suicide attempts among lesbian and bisexual women are 2 times more frequent than among heterosexual women (11).
- The lack of national-level data on suicide rates among LGBT people in Canada persists despite growing evidence of inequalities faced by LGBT communities in Canada and internationally (12). Regular disaggregation of population-level suicide data by LGBT identities could promote better understanding of and action on the inequalities facing these communities.
- A systematic review on risk factors for self-harm and suicide in different ethnic groups in the United Kingdom found significant differences in the rates of self-harm between ethnic groups. Asian males were the least likely to self-harm; Black females the most likely to self-harm. These ethnic differences may be due to factors such as cultural pressures and prevalence of mental illness (13).
- A systematic review on suicidality in people with an intellectual disability found that the most frequently reported risk factors were a concurrent mental health difficulty and degree of intellectual disability (14). Another large systematic review on the association between physical illness/functional disability and suicidal behaviour among adults aged 65 years and older found that suicidal behaviour is associated with functional disability and many conditions such as malignant diseases, neurological disorders, pain, chronic obstructive lung disease, liver disease, and arthritis (15).

DATA GAPS/LIMITATIONS

Suicide may not be reported accurately because definitions vary and causes of death cannot always be determined. In addition, the stigma associated with suicide may affect reporting (16). As a result, the underreporting of suicide deaths is a major limitation. Studies have estimated that between 10% and 30% of suicide deaths in Canada may be underreported due to misclassification (17). Moreover, there may be sex/gender differences in the underreporting of suicide deaths, with higher rates of underreporting among females (18).

Suicide data were not stratified according to several subpopulations known to have higher rates of suicide compared with the general population (e.g. by disability, sexual orientation, race/ethnicity) (19,20). As a result, there is a gap in reporting on suicide inequalities for these groups (see the box "From other studies: Inequalities in suicide-related behaviours and rates by ethnicity, disability, and sexual orientation").

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (10), calculating *p*-values would confirm statistically significant differences.

Area-based measures used to define social groups are aggregated at the dissemination area level. Given that this relies on the assumption that sociodemographic and socioeconomic groups are uniform, there is a potential for misclassification bias and the underestimation of inequalities. Although the directions of disparities may be the same between studies using area-based measures and individual-level measures, research has shown that the size of the disparities varies and is much larger when measured at the level of the individual (21). Moreover, the measures quantify the inequalities experienced by social groups that are defined in a largely aggregated way. For example, data on foreign-born residents as a group hide important differences between cultural groups: while studies show that immigrant status overall is a protective factor against suicide (22,23), these studies also point out that suicide rates vary depending on the country of origin (23,24) (see details on area-based measures).

DISCUSSION

Suicide is a major cause of premature and preventable death in Canada. In 2012 alone, there were 3 926 suicide deaths in Canada, which represents a rate of 10.4 deaths per 100 000 people. In this same year, 13 438 hospitalizations were associated with self-inflicted injuries in Canada (excluding Québec) (25). However, considerable differences in suicide rates were identified for a number of population groups, with more pronounced inequalities by socioeconomic status, Indigenous identity, immigrant status, and sex/gender.

Suicide rates were lowest among children and youth. Rates peaked in middle adulthood (ages 35 to 49 years and 50 to 64 years) among both males and females, and older age (80 years plus) among males only. Suicide rates were also significantly higher among males than among females for all ages. Other studies found that the highest rates of suicide occur during mid-life (ages 40 to 59 years) and that rates are higher among males than females of all ages (1). Research also found that while suicide rates among young people (ages 12–17 years) are lower than among older people, suicide remains one of the leading causes of death among youth (3).

Sex/gender differences in suicide-related behaviours are an important consideration. While males have higher rates of suicide deaths than females, the rates of suicide attempts are 3 to 4 times higher among females in Canada (1) and internationally (26). Moreover, the rate of hospitalizations for attempted suicide is 1.5 times higher among females than males (25). These differences may be because males are more likely to use more violent methods (25). Men may also be more vulnerable to suicide due to cultural norms surrounding masculinity, including the idealization of excessive self-reliance, which may lead to more extreme forms of social exclusion (27). Sex/gender differences in health behaviours may also be a factor. For example, among those diagnosed with mood or anxiety disorder in 2015, females were more likely than males to talk to a health professional about their emotional or mental health (28).

Suicide mortality rates in Canada are approximately in the middle of the range of member countries in the Organisation for Economic Co-operation and Development (OECD) (16). Across these countries, suicide rates among males are approximately 3 to 4 times higher than those among females (16). Similar to Canada, where higher rates of suicide were observed in areas where people had the lowest levels of education, higher rates of suicide among males with lower levels of education have been observed in some European countries. However, this pattern was not consistent across countries for females (29).

Suicide rates are nearly 4 times higher in areas where a high proportion of people self-identify as Indigenous, although there is significant heterogeneity across First Nations, Métis, or Inuit populations. In particular, males living in areas with a high concentration of people identifying as Inuit had disproportionally high rates of suicide rate compared with other groups. Previous research has shown that suicide rates vary significantly across First Nations communities, which may be explained by certain markers of cultural continuity (30). For example, youth suicide rates in 200 First Nations communities in British Columbia varied greatly depending on the community: more than half reported no youth suicide deaths during the 5 years of the study (31). Similar variations in youth suicide rates are evident across Inuit communities (32).

Finally, suicide rates in Métis communities in Manitoba were also shown to vary by region of residence (33).

While noting that incidence rates and risk/protective factors for suicides vary substantially across the nearly 200 Indigenous communities in British Columbia, some protective factors have been shown to be particularly relevant to First Nations communities. These include ties to the community, knowledge of traditional teachings, self-government (including autonomy over land, health, education, and language), and access to essential services such as police, fire, and housing (30,31,34).

The experience of colonialism is an important consideration to understanding higher rates of suicide in Indigenous communities across Canada. This includes individual and collective traumatic experiences that have had intergenerational impacts, such as forced displacement of families, residential schools, dislocations, disruptions to a traditional way of life, cultural oppression, loss of autonomy, systematic devaluing of Indigenous identity, and disconnection from the land (35).

Suicide rates are substantially lower in areas with a high proportion of foreign-born residents. This is consistent with research showing that age-standardized suicide mortality rates among first-generation immigrants are about half the rates among those born in Canada, at 7.9 versus 13.3 per 100 000 in 1995–1997 (23). This may be due to selection factors in the immigration process, with immigrants selected based on health-related criteria; it may also be due to an underreporting of deaths by suicide in this population (23). Less is known about the rate of suicide among longer-term immigrants and refugees in Canada, although some evidence suggests that refugees are more likely to experience posttraumatic stress disorder, which is a risk factor for suicide and suicide-related behaviours (36).

Important inequalities in suicide rates were also found between socioeconomic groups. Both education and income were inversely related to suicide rates, with deaths by suicide increasing as level of education or income decrease. Higher suicide rates have been consistently observed among people living in areas with lower levels of income and education, and in areas with higher levels of poverty and deprivation (37). Similarly, suicide rates were also higher in areas with high levels of material and social deprivation compared with areas with low levels of material and social deprivation. A few Canadian studies show that greater neighbourhood deprivation is associated with higher rates of suicide attempts and deaths (38,39). Other studies show that inequalities in suicide rates associated with material deprivation have widened over time in Canada (40).

The complex interactions of risk factors influencing suicide mortality make it difficult to explain or predict. Inequalities in death by suicide are prevalent across a range of social stratifications, including age, living in a remote area, and areas with a high concentration of Indigenous people. The socioeconomic gradient in suicide mortality is clear; suicide rates increase as household incomes and education levels decrease and as social and material deprivation increases. There are a number of individual risk factors, including mental illness, substance use, and addictions. However, these are impacted by social, economic, and physical environments, including employment status, economic climate, and housing status (41). Although largely ignored in academic reviews of approaches to suicide prevention and in the development of national suicide strategies (41), the systematic measurement of health inequalities of Canadians who have died by or attempted suicide will help to inform and strengthen interventions to reduce these differences and impacts. While the ultimate goal of suicide surveillance and programming is to prevent suicide for all population groups, addressing these highlighted inequalities through policy interventions that can impact broader influences is essential. The ongoing monitoring of these health inequalities across sociodemographic and socioeconomic groups will in turn inform programs, policies, and research, now and in the future.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Suicide Deaths Rate per 100 000. Data Source: CMDB 2009-2011

					SUMMARY MEASURES									POPULATION IMPACT MEASURES								
Social Stratifiers		Age-standardized rate (per 100 000)			Rate Ratio (RR)			Rate Difference (RD) per 100 000			Attributable Fraction (AF%)			Population Attributable Fraction (PAF%)			Population Attributable Rate (PAR) per 100 000			Population Impact Number (PIN)		
		Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males
Overall	Both Sexes	11.3	5.4	17.4	NA									NA								
Population Groups																						
Sex/gender	Male	17.7	NA		3.3 *	NA	NA	12.3 *	NA	NA	69.5 *	NA	NA	52.6 *	NA	NA	5.9 *	NA	NA	1,989 *	NA	NA
	Female [reference]	5.4			Reference																	
Predominant Indigenous identity group (area-based measure)	First Nations as predominant group	40.2	24.5	56.2	3.7 *	4.7 *	3.2 *	29.2 *	19.3 *	38.9 *	72.6 *	78.8 *	69.2 *	2.8 *	4.1 *	2.4 *	0.3 *	0.2 *	0.4 *	105 *	38 *	68 *
	Inuit as predominant group	72.0	24.5	118.2	6.5 *	4.7 *	6.8 *	61.0 *	19.3 *	100.9 *	84.7 *	78.8 *	85.4 *	1.0 *	0.7 *	1.1 *	0.1 *	0.0 *	0.2 *	37 *	7 *	31 *
	Métis as predominant group	29.6	15.9	44.1	2.7 *	3.1 *	2.5 *	18.6 *	10.7 *	26.8 *	62.8 *	67.3 *	60.8 *	0.3 *	0.5 *	0.3 *	0.0 *	0.0 *	0.1 *	13 *	4 *	9 *
	Low concentration of First Natons/Inuit/Métis identity [reference]	11.0	5.2	17.3	Reference																	
Immigrant status (area-based measure)	Low foreign-born proportion	12.5	5.7	19.7	1.7 *	1.4 *	1.8 *	5.3 *	1.7 *	8.9 *	42.4 *	29.8 *	45.2 *	32.9 *	22.1 *	35.6 *	3.7 *	1.2 *	6.2 *	1,197 *	195 *	980 *
	Medium foreign-born proportion	9.2	4.8	13.9	1.3 *	1.2 *	1.3 *	2.0 *	0.8 *	3.1 *	21.7 *	16.7 *	22.3 *	3.4 *	2.9 *	3.3 *	0.4 *	0.2 *	0.6 *	123 *	26 *	91 *
	High foreign-born proportion) [reference]	7.2	4.0	10.8	Reference																	
Rural/urban residence	Remote areas	22.0	9.7	34.6	1.9 *	1.7 *	2.0 *	10.7 *	4.1 *	17.3 *	48.6 *	42.3 *	50.0 *	4.9 *	3.8 *	5.2 *	0.6 *	0.2 *	0.9 *	186 *	35 *	150 *
	Provincial rural areas	15.1	6.1	24.3	1.3 *	1.1	1.4 *	3.8 *	0.5	7.0 *	25.2 *	8.2	28.8 *	3.8 *	1.0	4.6 *	0.4 *	0.1	0.8 *	143 *	10	131 *
	Small urban centres	12.8	6.3	19.7	1.1 *	1.1 *	1.1 *	1.5 *	0.7 *	2.4 *	11.7 *	11.1 *	12.2 *	1.7 *	1.6 *	1.7 *	0.2 *	0.1	0.3 *	63 *	15	49 *
	Toronto, Montréal, and Vancouver	8.8	4.4	13.7	0.8 *	0.8 *	0.8 *	-2.5 *	-1.2 *	-3.6 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Large urban centres other than Toronto, Montréal and Vancouver [reference]	11.3	5.6	17.3	Reference																	
Socioeconomic Determinants of Health																						
Income quintile (area-based measure)	Q1 (lowest income)	15.9	8.3	24.1	1.8 *	1.8 *	1.8 *	7.0 *	3.7 *	10.6 *	44.0 *	44.6 *	44.0 *	11.5 *	12.7 *	11.2 *	1.3 *	0.7 *	2.0 *	431 *	115 *	317 *
	Q2	12.6	6.1	19.5	1.4 *	1.3 *	1.4 *	3.7 *	1.5 *	6.0 *	29.4 *	24.6 *	30.8 *	6.3 *	5.4 *	6.6 *	0.7 *	0.3 *	1.2 *	237 *	49 *	188 *
	Q3	10.8	4.7	17.3	1.2 *	1.0	1.3 *	1.9 *	0.1	3.8 *	17.6 *	2.1	22.0 *	3.4 *	0.4	4.3 *	0.4 *	0.0	0.8 *	126 *	3	123 *
	Q4	9.7	4.0	15.7	1.1 *	0.9	1.2 *	0.8 *	-0.6	2.2 *	8.2 *	NA	14.0 *	1.4 *	NA	2.6 *	0.2 *	NA	0.5 *	54 *	NA	73 *
	Q5 (highest income) [reference]	8.9	4.6	13.5	Reference																	
Education (area-based measure)	Q1 (lowest education)	15.0	6.9	23.3	1.6 *	1.4 *	1.6 *	5.5 *	2.10 *	8.6 *	36.7 *	30.4 *	36.9 *	9.5 *	7.5 *	9.7 *	1.1 *	0.4 *	1.7 *	357 *	68 *	276 *
	Q2	12.0	5.6	18.7	1.3 *	1.2 *	1.3 *	2.5 *	0.8 *	4.0 *	20.8 *	14.3 *	21.4 *	4.3 *	2.9 *	4.4 *	0.5 *	0.2 *	0.8 *	161 *	26 *	126 *
	Q3	11.0	5.3	17.2	1.2 *	1.1	1.2 *	1.5 *	0.5	2.5 *	13.6 *	9.4	14.5 *	2.6 *	1.8	2.8 *	0.3 *	0.1	0.5 *	98 *	17	79 *
	Q4	10.1	4.7	15.9	1.1	1.0	1.1 *	0.6	-0.1	1.2 *	5.9	NA	7.5 *	1.0	NA	1.3 *	0.1	NA	0.2 *	39	NA	38 *
	Q5 (highest education) [reference]	9.5	4.8	14.7	Reference																	
Deprivation index—material (area-based measure)	Q5 (most deprived)	14.8	6.9	23.1	1.6 *	1.5 *	1.7 *	5.8 *	2.3 *	9.4 *	39.2 *	33.3 *	40.7 *	9.6 *	7.9 *	10.1 *	1.1 *	0.4 *	1.7 *	343 *	69 *	273 *
	Q4	12.1	5.2	19.3	1.3 *	1.1	1.4 *	3.1 *	0.6	5.6 *	25.6 *	11.5	29.0 *	5.3 *	2.2	6.2 *	0.6 *	0.1	1.1 *	190 *	19	168 *
	Q3	11.3	5.5	17.4	1.3 *	1.2 *	1.3 *	2.3 *	0.9 *	3.7 *	20.4 *	16.4 *	21.3 *	4.1 *	3.3 *	4.2 *	0.5 *	0.2 *	0.7 *	145 *	29 *	114 *
	Q2	9.8	4.8	15.3	1.1 *	1.0	1.1 *	0.8 *	0.2	1.6 *	8.2 *	4.2	10.5 *	1.5 *	0.8	1.9 *	0.2 *	0.0	0.3 *	53 *	7	51 *
	Q1 (least deprived) [reference]	9.0	4.6	13.7	Reference																	
Deprivation index—social (area-based measure)	Q5 (most deprived)	15.2	8.3	23.0	1.7 *	2.4 *	1.6 *	6.5 *	4.8 *	9.0 *	42.8 *	57.8 *	39.1 *	11.4 *	17.9 *	9.9 *	1.3 *	1.0 *	1.7 *	408 *	155 *	269 *
	Q4	12.3	6.1	19.0	1.4 *	1.7 *	1.4 *	3.6 *	2.6 *	5.0 *	29.3 *	42.6 *	26.3 *	6.3 *	9.6 *	5.5 *	0.7 *	0.5 *	1.0 *	224 *	83 *	150 *
	Q3	10.8	4.7	17.3	1.2 *	1.3 *	1.2 *	2.1 *	1.2 *	3.3 *	19.4 *	25.5 *	19.1 *	3.7 *	4.5 *	3.8 *	0.4 *	0.2 *	0.7 *	134 *	39 *	102 *
	Q2	10.0	4.3	15.9	1.1 *	1.2 *	1.1 *	1.3 *	0.8 *	1.9 *	13.0 *	18.6 *	12.0 *	2.3 *	3.0 *	2.2 *	0.3 *	0.2 *	0.4 *	83 *	26 *	60 *
	Q1 (least deprived) [reference]	8.7	3.5	14.0	Reference																	
Deprivation index—material & social (area-based measure)	Q5Q5 (most deprived)	21.3	11.5	31.9	2.7 *	2.7 *	2.8 *	13.5 *	7.2 *	20.3 *	63.4 *	62.6 *	63.6 *	4.5 *	5.0 *	4.3 *	0.5 *	0.3 *	0.7 *	162 *	44 *	117 *
	Q1Q1 (least deprived) [reference]	7.8	4.3	11.6	Reference																	

NOTE:

The purpose of the colour scaling is to map (for all indicators and stratifiers) 1– the relative and absolute inequalities; 2– the patterns of inequalities (e.g. Indigenous populations frequently experience inequalities compared to non-Indigenous); 3– the gradients of inequalities (e.g. there are frequently inequalities in a gradient across income strata). The magnitude and distribution of inequalities shown in this table should be interpreted with caution, taking into consideration one indicator at a time, the differences among the data sources used (e.g. survey vs. administrative register), and existing limitations in the measurement of the social stratifiers.

Colour scaling for rate ratios below 1 and rate differences below 0 was applied using the reciprocal value and the absolute value respectively. For example, for a RR of 0.5, the colour scale applied is for the value 2.0 (1/0.5) and for a RD of -10, the colour scale for the value 10 is used. Colour scaling is only applied when the difference between the value and the reference group is statistically significant.

LEGEND

Non-applicable	NA
Non-reportable	F
Report with Caution	E
Statistically Significant	*
Reference	▨

RR	RD per 100 000
> 1.8	> 930
1.5 → 1.8	280 → 930
1.3 → 1.5	120 → 280
1.2 → 1.3	60 → 120
1.1 → 1.2	30 → 60
1.0 → 1.1	0 → 30

Larger inequality

↕

Smaller inequality

References

(1) Navaneelan T. Suicide rates: An overview. Statistics Canada; 2012 [cited 20 November, 2017].

(2) Statistics Canada. [Internet]. Ottawa, ON: Statistics Canada; 2015. Deaths and mortality rate, by selected grouped causes, age group and sex, Canada [updated 2017 16 November, 2017; cited 20 November, 2017]; [about 5 screens]. Available from: http://www5.statcan.gc.ca/cansim/a26?id=1020551&.

(3) Statistics Canada. [Internet]. Cansim Table 102-0561: Leading causes of death, total population, by age group and sex, Canada [updated 2017 16 November, 2017; cited 20 November, 2017]; [about 4 screens]. Available from: http://www5.statcan.gc.ca/cansim/a47.

(4) Canadian Association for Suicide Prevention. [Internet]. Waterloo, ON: Canadian Association for Suicide Prevention; 2015. What is Suicide?[updated 2016 Available from: http://suicideprevention.ca/understanding/what-is-suicide/.

(5) Parachute. The cost of injury in Canada [Internet]. Toronto: Parachute; 2015 [cited 2017 Jul 31]. Available from: http://www.parachutecanada.org/downloads/research/Cost_of_Injury-2015.pdf.

(6) World Health Organization. Preventing suicide: A global imperative [Internet]. Geneva, SW: World Health Organization Press; 2014 Available from: http://www.who.int/mental_health/suicide-prevention/world_report_2014/en/.

(7) Cavanagh JT, Carson AJ, Sharpe M, Lawrie SM. Psychological autopsy studies of suicide: a systematic review. Psychol Med. 2003;33(03):395-405.

(8) Arsenault-Lapierre G, Kim C, Turecki G. Psychiatric diagnoses in 3275 suicides: a meta-analysis. BMC Psychiatry. 2004;4(37):1-11.

(9) McLean J, Maxwell M, Platt S, Harris F and Jepsen R. Risk and protective factors for suicide and suicidal behaviour: A literature review [Internet]. Edinburgh: The Scottish Government; 2008 Available from: http://www.scotland.gov.uk/Publications/2008/11/28141444/0.

(10) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(11) King M, Semlyen J, Tai SS, Killaspy H, Osborn D, Popelyuk D, et al. A systematic review of mental disorder, suicide, and deliberate self harm in lesbian, gay and bisexual people. BMC Psychiatry. 2008 Aug;8(1):70.

(12) Haas AP, Rodgers PL and Herman JL. Suicide attempts among transgender and gender non-conforming adults [Internet]. The Williams Institute; 2014 Available from: https://queeramnesty.ch/docs/AFSP-Williams-Suicide-Report-Final.pdf.

(13) Al-Sharifi A, Krynicki CR, Upthegrove R. Self-harm and ethnicity: a systematic review. Int J Soc Psychiatry. 2015;61(6):600-12.

(14) Dodd P, Doherty A, Guerin S. A Systematic Review of Suicidality in People with Intellectual Disabilities. Harv Rev Psychiatry. 2016 May-Jun;24(3):202-13.

(15) Fässberg MM, Cheung G, Canetto SS, Erlangsen A, Lapierre S, Lindner R, et al. A systematic review of physical illness, functional disability, and suicidal behaviour among older adults. Aging & mental health. 2016;20(2):166-94.

(16) OECD. Society at a Glance 2016: OECD Social Indicators [Internet]. Paris, France: OECD Publishing; 2016 Available from: http://www.keepeek.com/Digital-Asset-Management/oecd/social-issues-migration-health/society-at-a-glance-2016_9789264261488-en#.WI9YL1MwiUk#page1.

(17) Skinner R, McFaull S, Rhodes AE, Bowes M, Rockett IRH. Suicide in Canada: Is Poisoning Misclassification an Issue? Canadian Journal of Psychiatry.Revue Canadienne de Psychiatrie. 2016 03/23;61(7):405-12.

(18) Auger N, Burrows S, Gamache P, Hamel D. Suicide in Canada: impact of injuries with undetermined intent on regional rankings. Inj Prev. 2016 Feb;22(1):76-8.

(19) Giannini MJ, Bergmark B, Kreshover S, Elias E, Plummer C, O'Keefe E. Understanding suicide and disability through three major disabling conditions: Intellectual disability, spinal cord injury, and multiple sclerosis. Disability and Health Journal. 2010 4;3(2):74-8.

(20) Bolton SL, Sareen J. Sexual orientation and its relation to mental disorders and suicide attempts: findings from a nationally representative sample. Can J Psychiatry. 2011 Jan;56(1):35-43.

(21) Pampalon R, Hamel D, Gamache P. A comparison of individual and area-based socio-economic data for monitoring social inequalities in health. Health Report. 2009 Dec;20(4):85.

(22) DesMeules M, Gold J, McDermott S, Cao Z, Payne J, Lafrance B, et al. Disparities in mortality patterns among Canadian immigrants and refugees, 1980-1998: Results from a national cohort study. J Immigr Health. 2005 Oct;7(4):221-32.

(23) Malenfant EC. Suicide in Canada's immigrant population [Internet]. Statistics Canada; 2004 Available from: http://search.proquest.com/docview/207471408?pq-origsite=gscholar.

(24) Vang Z, Sigouin J, Flenon A, Gagnon A. The healthy immigrant effect in Canada: A systematic review. Population Change and Lifecourse Strategic Knowledge Cluster Discussion Paper Series/Un Réseau stratégique de connaissances Changements de population et parcours de vie Document de travail. 2015;3(1):4.

(25) Skinner R, McFaull S, Draca J, et al. Suicide and self-inflicted injury hospitalizations in Canada (1979 to 2014/15) [Internet]. Public Health Agency of Canada; 2016 Available from: https://www.ncbi.nlm.nih.gov/pubmed/27882859.

(26) OECD. [Internet]. OECD Publishing; 2016. Suicide rates (indicator) Available from: http://www.oecd-ilibrary.org/social-issues-migration-health/suicide-rates/indicator/english_a82f3459-en.

(27) Mikkonen J, Raphael D. Social determinants of health: The Canadian facts. : York University, School of Health Policy and Management; 2010.

(28) Statistics Canada. [Internet]. Canadian Community Health Survey, 2015 [updated 2015 cited 20 November, 2017]; [about 3 screens]. Available from: http://www.statcan.gc.ca/daily-quotidien/170322/dq170322a-eng.pdf.

(29) Lorant V, Kunst AE, Huisman M, Costa G, Mackenbach J, EU Working Group on Socio-Economic Inequalities in Health. Socio-economic inequalities in suicide: a European comparative study. Br J Psychiatry. 2005 Jul;187:49-54.

(30) Chandler MJ, Lalonde CE. Cultural continuity as a protective factor against suicide in First Nations youth. Transcultural Psychiatry. 2008;10(1):68-72.

(31) Chandler MJ, Lalonde CE. Cultural continuity as a hedge against suicide in Canada's First Nations. Transcultural Psychiatry. 1998;35(2):191-219.

(32) Hicks J. Statistical data on death by suicide by Nunavut Inuit, 1920 to 2014 [Internet]. Nunavut Tunngavik Inc; 2015 Available from: https://www.tunngavik.com/files/2015/09/2015-09-14-Statistical-Historical-Suicide-Date-Eng.pdf.

(33) Martens P, Bartlett J, Burland E, et al. Profile of Metis Health Status and Healthcare Utilization in Manitoba: A Population-Based Study [Internet]. Winnipeg: Manitoba Centre for Health Policy; 2010 [cited 2017 Sep 29]. Available from: http://mchp-appserv.cpe.umanitoba.ca/reference/MCHP-Metis_Health_Status_Full_Report_(WEB)_(update_aug11_2011).pdf.

(34) Centre for Suicide Prevention. [Internet]. Calgary, AB: Indigenous Suicide Prevention [updated 2003 cited 20 November, 2017]; [about 13 screens]. Available from: https://www.suicideinfo.ca/resource/indigenous-suicide-prevention/.

(35) Kirmayer LJ, Valaskakis GG. Healing traditions: The mental health of Aboriginal peoples in Canada. Vancouver: UBC press; 2009.

(36) Kirmayer LJ, Narasiah L, Munoz M, Rashid M, Ryder AG, Guzder J, et al. Common mental health problems in immigrants and refugees: general approach in primary care. CMAJ. 2011 Sep 6;183(12):E959-67.

(37) Rehkopf DH, Buka SL. The association between suicide and the socio-economic characteristics of geographical areas: a systematic review. Psychol Med. 2006;36(02):145-57.

(38) Agbayewa MO, Marion SA, Wiggins S. Socioeconomic factors associated with suicide in elderly populations in British Columbia: an 11-year review. The Canadian Journal of Psychiatry. 1998;43(8):829-36.

(39) Hasselback P, Lee KI, Mao Y, Nichol R, Wigle DT. The relationship of suicide rates to sociodemographic factors in Canadian census divisions. The Canadian Journal of Psychiatry. 1991;36(9):655-9.

(40) Burrows S, Auger N, Roy M, Alix C. Socioeconomic inequalities in suicide attempts and suicide mortality in Québec, Canada, 1990–2005. Public Health. 2010;124(2):78-85.

(41) Platt S. Inequalities and suicidal behavior. The International Handbook of Suicide Prevention. 2011:258-83.

HEALTH OUTCOMES

SELF-ASSESSED HEALTH

INEQUALITIES IN
PERCEIVED MENTAL HEALTH (LOW SELF-RATED MENTAL HEALTH) AND MENTAL ILLNESS HOSPITALIZATION IN CANADA

INEQUALITIES HIGHLIGHTS

- The prevalence of low self-rated mental health (SRMH) among adults permanently unable to work is 7.9 times the prevalence among employed adults. This corresponds to 28.5 more cases of low SRMH per 100 people among adults permanently unable to work than among employed adults.
- Low SRMH reported by adults in the lowest income group is 4.1 times that of adults in the highest income group. This means there are 9.2 more people with low SRMH per 100 people among adults in the lowest income group than among adults in the highest income group.
- The prevalence of low SRMH among adults with less than a high school education is 2.9 times that of university graduates. This corresponds to 7.2 more people with low SRMH per 100 people among adults with less than a high school education than among university graduates.
- The prevalence of low SRMH among bisexual or gay/lesbian adults is 3.1 and 1.7 times, respectively, that of heterosexual adults. This equates to 12.0 and 4.0 more cases of low SRMH per 100 people among bisexual or gay/lesbian adults, respectively, than among heterosexual adults.
- The prevalence of low SRMH among people working in unskilled occupations is 2.2 times that of people in professional occupations. This corresponds to 3.7 more people with low SRMH per 100 people among people working in unskilled occupations than among people in professional occupations.
- The prevalence of low SRMH among First Nations living off reserve and Métis is 1.9 and 1.5 times, respectively, that of non-Indigenous people. This equates to 5.1 and 2.7 more people with low SRMH per 100 people among First Nations living off reserve and Métis, respectively, than among non-Indigenous people.
- Compared with 5.8% of White Canadians, 7.1% of East/Southeast Asians and 4.2% of South Asians report low SRMH.

ACRONYM	FULL NAME
CCHS	Canadian Community Health Survey
CI	Confidence Interval
FNIGC	First Nations Information Governance Centre
HMHDB	Hospital Mental Health Database
RHS	First Nations Regional Health Survey
SRMH	Self-Rated Mental Health

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Mental health can be defined as "the capacity of each and all of us to feel, think, act in ways that enhance our ability to enjoy life and deal with the challenges we face. It is a positive sense of emotional and spiritual well-being that respects the importance of culture, equity, social justice, interconnections and personal dignity." (1) Self-rated mental health (SRMH) is a subjective measure of overall mental health status. It incorporates information about mental illness and distress, as well as positive states and evaluations of well-being (2).

While SRMH and specific mental health measures are not interchangeable, strong and consistent associations exist between SRMH and a wide range of mental illnesses. For instance, the prevalence of low SRMH among Canadians (15 years or older) who reported that they had been diagnosed with a mental disorder was 46%, while the prevalence of low SRMH among Canadians who did not report a mental disorder was 6% (2). Low SRMH may also be predictive of developing mental health problems (3).

While people living with mental illness are more likely to report low SRMH, about one-half report good or better SRMH, demonstrating that SRMH is not a measure of mental illness (2).

Mental health is influenced by biological, environmental, and social factors. Many social determinants of health are consistently associated with low SRMH, including socioeconomic status (4), social support (5), community belonging (6), activity restriction, social role functioning (7), and service use (8). The experience of violence, poverty, inadequate housing, problems finding work or getting an education, and lack of clean water or affordable food are also risks to mental health (9,10). Moreover, the disadvantage that makes people prone to poor mental health starts before birth and accumulates throughout life (11).

In 2014, 6.3% of Canadians (12 years and older) reported their mental health as fair or poor, an increase from 5.6% in 2011 (12). Although having fair or poor mental health is not the same as having a mental illness, people reporting low SRMH are significantly more likely to receive medical services due to mental illness (8).

SRMH and mental illness hospitalizations were selected as two indicators of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter.)

METHODS

Data on SRMH and stratifier variables were collected through the Canadian Community Health Survey (CCHS) from 2010 to 2013. Respondents were asked to rate their mental health as "excellent," "very good," "good," "fair," or "poor." For this analysis, responses of "fair" or "poor" are considered as measures of low SRMH.

The analysis of low SRMH included people 18 years and older. Inequalities in SRMH were assessed by measuring differences in low SRMH according to social stratifiers grouped under socioeconomic and sociodemographic stratifiers collected through the CCHS. Sociodemographic stratifiers include sex/gender, Indigenous identity, cultural/racial background, sexual orientation[21] (ages 18–59 years), immigrant status, and rural/urban residence. Socioeconomic stratifiers include income, education (ages 20+ years), occupation, and employment status (ages 18–75 years). Prevalence data were age-standardized using the 2011 Canadian Census of Population.

For the Indigenous identity stratifier, the CCHS sampling frame captures information on Indigenous peoples who identify as Inuit, Métis, or First Nations living off reserve but excludes First Nations living on reserve and Inuit in the Quebec region of Nunavik. For First Nations people living on reserve and in northern communities, comparable information is collected by the First Nations Information Governance Centre (FNIGC) and its regional partners through the First Nations Regional Health Survey (RHS). This chapter uses RHS data from 2008 to 2010, which collected low SRMH data for youth (12–17 years of age) only.

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many of these differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported along with the corresponding 95% confidence intervals (CIs). Statistical significance was assessed using 95% confidence intervals (13). Sex/gender-specific inequalities for stratifiers were reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable risk, population attributable fraction, and population impact number. The data presented for First Nations peoples living on reserve and in northern communities include solely the prevalence of low SRMH and were not subjected to inequality measures calculations.

Methods and findings for mental illness hospitalizations are summarized in Box 1.

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in the Canadian context. (For more detailed information, see the Methodology chapter.)

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[21] The CCHS does not collect data on sexual orientation from individuals over the age of 59 years.

FINDINGS

The overall prevalence of low SRMH among Canadians 18 years and older for the years 2010 to 2013 was 5.9% (95% CI: 5.8–6.1%) (Annex 1). Many social groups experienced inequalities in low SRMH and hospitalization for mental illness. A more detailed set of inequality findings for perceived mental health and mental illness hospitalization are presented in Annexes 1 and 2, respectively. (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Sex/Gender

The prevalence of low SRMH among women was 6.3% (95% CI: 6.1–6.6), which was 1.1 times that of men (5.6%; 95% CI: 5.3–5.8%). If the prevalence of low SRMH among women was the same as among men, there would be 104 130 fewer women reporting low SRMH. This would reduce the prevalence of low SRMH among women by 12% (95% CI: 6.9–17.0) and that in the total Canadian population by 6.5% (95% CI: 3.6, 9.4) (Annex 1).

Indigenous Peoples

First Nations people living off reserve reported a prevalence of low SRMH 1.9 (95% CI: 1.6–2.2) times that of non-Indigenous people. Similarly, Métis reported a prevalence of low SRMH 1.5 (95% CI: 1.2–1.7) times that of non-Indigenous people. This represented, respectively, 5.1 (95% CI: 3.5–6.7) and 2.7 (95% CI: 1.2–4.2) more reports of low SRMH per 100 people among First Nations living off reserve and Métis than among non-Indigenous adults. There was no significant difference in the prevalence of low SRMH between Inuit and non-Indigenous people (Figure 1).

For First Nations people living on reserve and in northern communities, RHS 2008/10 data for the low SRMH indicator are available only for youth (12–17 years of age). The prevalence of low SRMH for First Nations youth living on reserve and in northern communities was 6.5% (95% CI: 5.6-7.5%; not age-adjusted); among non-Indigenous youth, the prevalence of low SRMH has been estimated at 3.5% (95% CI: 3.0-4.0%) (14). Furthermore, the prevalence of low SRMH among First Nations girls (7.8%; 95% CI: 6.5-9.3%) was 1.5 times the prevalence among First Nations boys (5.3%; 95% CI: 4.1-6.8%).

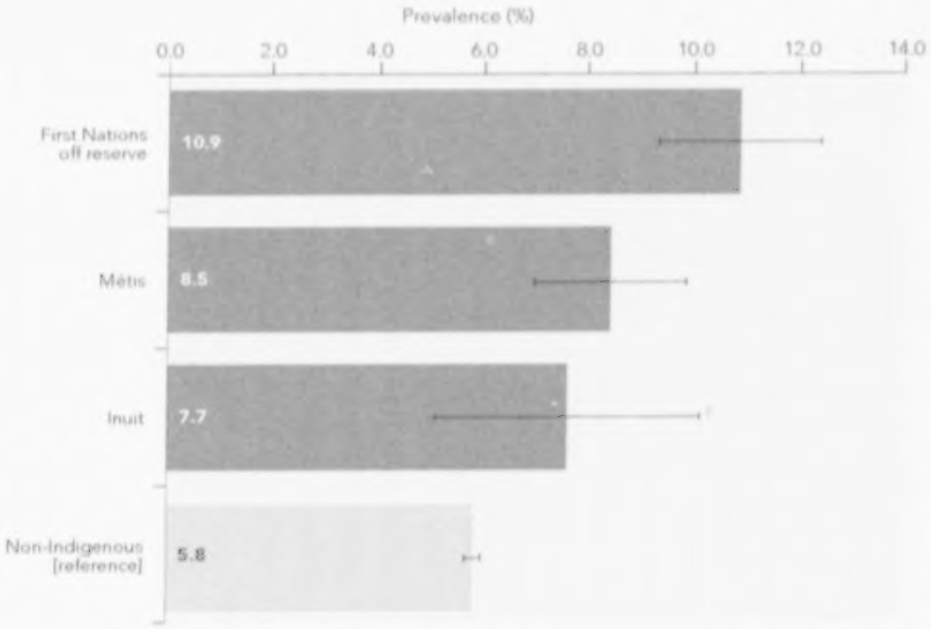
Cultural/Racial Background

The prevalence of low SRMH varies slightly by cultural/racial background. At 7.1% (95% CI: 6.1–8.2), the proportion of East/Southeast Asian adults reporting low SRMH was significantly higher than the proportion of White adults reporting low SRMH (5.8%; 95% CI: 5.6–6.0%). At 4.2% (95% CI: 3.2–5.1), South Asian adults had a significantly lower prevalence of low SRMH (Annex 1).

If the prevalence of low SRMH among East/Southeast Asian adults had been the same as that among White adults, low SRMH among East/Southeast Asian adults would be reduced by 18.7% (95% CI: 5.5–31.8).

FIGURE 1

Low Self-Rated Mental Health by Employment Status and Sex/Gender, Canada, ages 18–75 years, 2010–2013



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
First Nations off reserve	1.9*	5.1*	47.0*	1.3*	0.1*	21 380*
Métis	1.5*	2.7*	32.0*	0.6*	0.0*	10 210*
Inuit	1.3^{E}	2.0^{E}	25.4^{*E}	0.0^{E}	0.0^{E}	560^{E}
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
E: Reportable with caution
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010 –2013

Sexual Orientation (ages 18–59 years)

Low SRMH was more prevalent in adults who identified as bisexual and lesbian or gay than among adults who identified as heterosexual. The prevalence of low SRMH among bisexual and lesbian/gay adults who reported low SRMH was, respectively, 3.1 (95% CI: 2.6–3.6) and 1.7 (95% CI: 1.4–2.1) times the prevalence among heterosexual adults (Figure 2).

If the prevalence of low SRMH was the same for bisexual or lesbian/gay adults as for heterosexual adults, SRMH would be reduced by 67.7% (95% CI: 61.9–73.5) among bisexual adults and by 42.6% (95% CI: 30.2–55.1) among lesbian/gay adults.

Immigrant Status

The prevalence of low SRMH among recent immigrants (≤10 years in Canada) was 0.7 (95% CI: 0.5–1.0) times the prevalence among non-immigrants. The difference in prevalence of low SRMH between long-term immigrants (>10 years in Canada) and non-immigrants was not statistically significant (Annex 1).

Income

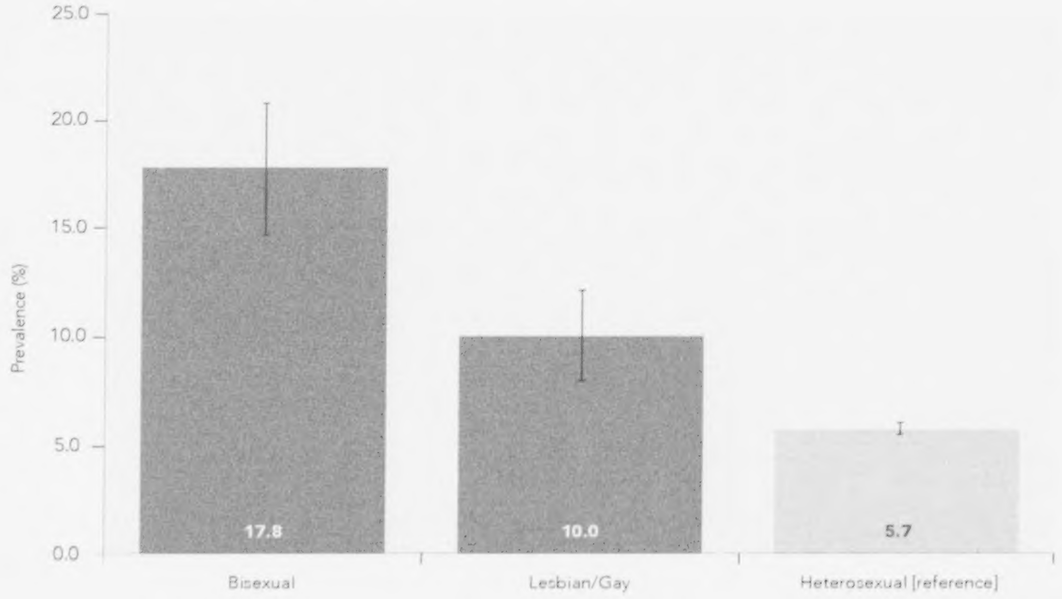
There was a clear relationship between income and prevalence of low SRMH: as income increased, prevalence decreased considerably. The prevalence of low SRMH among Canadian adults in the lowest income quintile was 12.2% (95% CI: 11.5–12.9%). This was 4.1 (95% CI: 3.7–4.6) times the prevalence among Canadian adults in the highest income quintile, at 3.0% (95% CI: 2.7–3.3%) (Figure 3).

If the prevalence of low SRMH among adults in the lowest income quintile had been the same as that among adults in the highest income quintile, there would be a 75.8% (95% CI: 73.0–78.6%) reduction in low SRMH among adults in the lowest income quintile and a 28.5% (95% CI: 26.5–30.5%) reduction in the overall proportion of Canadians with low SRMH. This would, hypothetically, result in 468 250 (95% CI: 430 600–505 890) fewer reports of low SRMH among adult Canadians. The magnitude of inequalities according to income was similar for men and women.

> If the prevalence of low SRMH among adults in the lowest income quintile was the same as that for adults in the highest income quintile, there would be 468 250 fewer cases of low SRMH in Canada.

FIGURE 2

Low Self-Rated Mental Health by Sexual Orientation, Canada, ages 18–59 years, 2010–2013

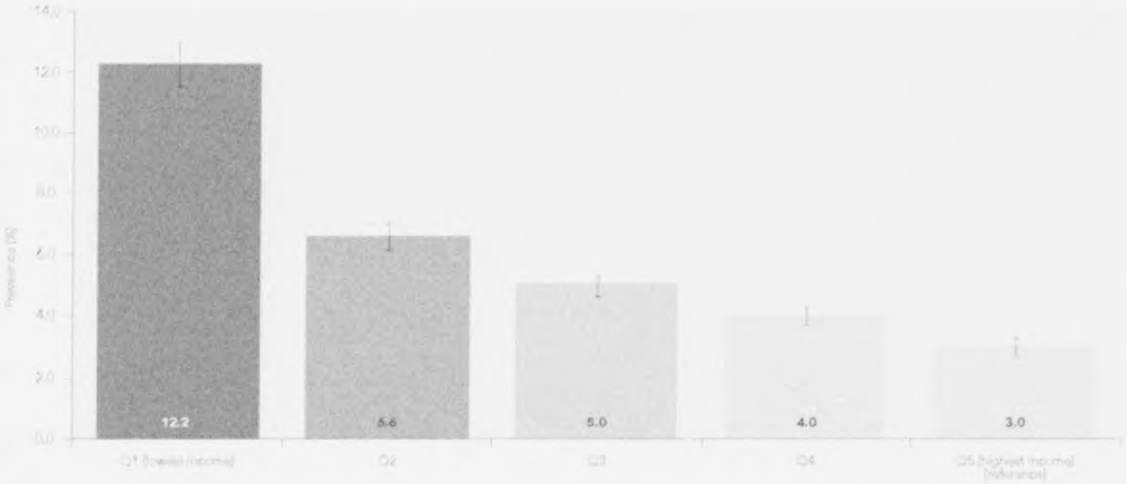


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Bisexual	3.1*	12.0*	67.7*	2.1*	0.1*	24 980*
Lesbian/Gay	1.7*	4.3*	42.6*	1.0*	0.1*	11 490*
Heterosexual [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

FIGURE 3

Low Self-Rated Mental Health by Income Quintile, Canada, ages 18+ years, 2010–2013



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Q1 (lowest income)	4.1*	9.2*	75.8*	28.5*	1.7*	468 250*
Q2	2.2*	3.6*	55.0*	11.1*	0.7*	183 240*
Q3	1.7*	2.0*	40.6*	6.3*	0.4*	103 080*
Q4	1.4*	1.1*	26.4*	3.4*	0.2*	55 350*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

Education (ages 20+ years)

The prevalence of low SRMH among Canadian adults with less than a high school education was 11.0% (95% CI: 10.1–11.8). This was 2.9 (95% CI: 2.59–3.2) times the prevalence of low SRMH among university graduates (3.8%; 95% CI: 3.5–4.1%).

If the prevalence of low SRMH among adults who had not completed high school had been the same as that among university graduates, there would be a 65.7% (95% CI: 61.9–69.5) reduction in this prevalence among adults with less than a high school education. This would have resulted in a 15.2% (95% CI: 13.4–17.0%) reduction in the overall national prevalence of low SRMH, which would correspond to 238 640 (95% CI: 208 670–268 620) fewer Canadian adults with low SRMH (Figure 4).

Employment Status and Occupation

There were clear inequalities in the prevalence of low SRMH by employment and occupation. The prevalence of low SRMH in workers in unskilled, semiskilled, and skilled technical occupations was, respectively, 2.2 (95% CI: 1.8– 2.6), 1.6 (95% CI: 1.3–1.8), and 1.3 (95% CI: 1.1–1.5) times the prevalence of those working in professional occupations (Annex 1).

The prevalence of low SRMH among adults who were permanently unable to work was 32.6% (95% CI: 29.4–35.9%). This was 7.8 (95% CI: 7.0–8.7) times the prevalence among employed adults of 4.2% (95% CI: 4.0–4.4%). This means there were 29 (95% CI: 25.2–31.7) more cases of low SRMH per 100 people among adults who were permanently unable to work than among employed adults (Figure 5).

If the prevalence of low SRMH among adults who were permanently unable to work was as low as the prevalence among employed adults, there would be an 87.3% (95% CI: 85.8–88.7) reduction in the prevalence of low SRMH among those permanently unable to work and a 12.0% (95% CI: 10.6–13.4) reduction in the prevalence of low SRMH in Canada. This would result in 190 840 (95% CI: 167 230–214 460]) fewer Canadian adults with low SRMH.

Rural/Urban Residence

Few statistically significant inequalities were found by rural/urban residence[22]. There was, however, a significant difference between women living in provincial rural areas and those living in large urban centres (excluding Toronto, Montréal, and Vancouver) (Annex 1). Women living in provincial rural areas reported low SRMH 0.8 (95% CI: 0.7–0.9) times that of women living in large urban centres (excluding Toronto, Montréal, and Vancouver).

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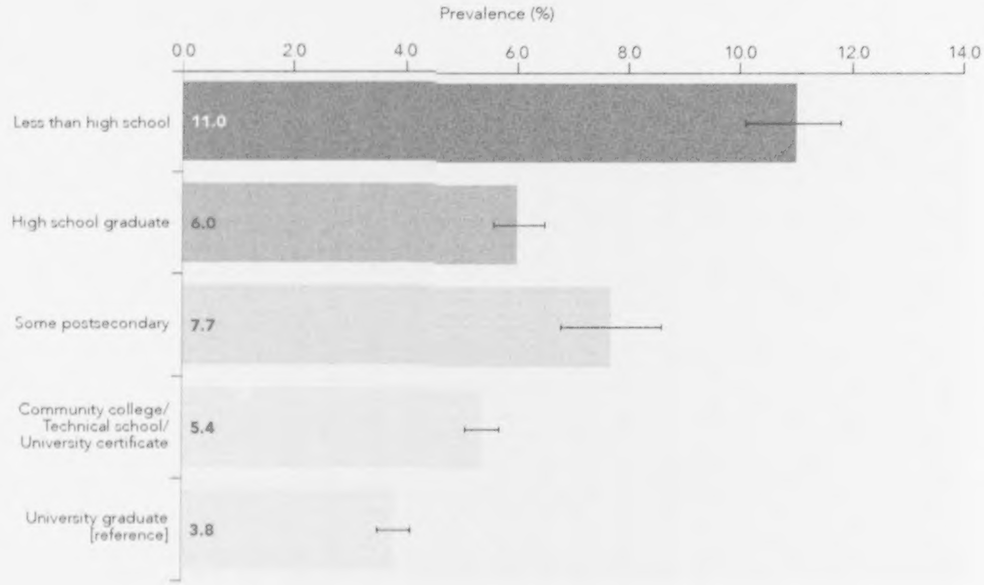
22. For definitions of rural/urban subgroups, see the Methodology chapter.

FIGURE 4

Low Self-Rated Mental Health by Education Level, Canada, ages 20+ years, 2010–2013

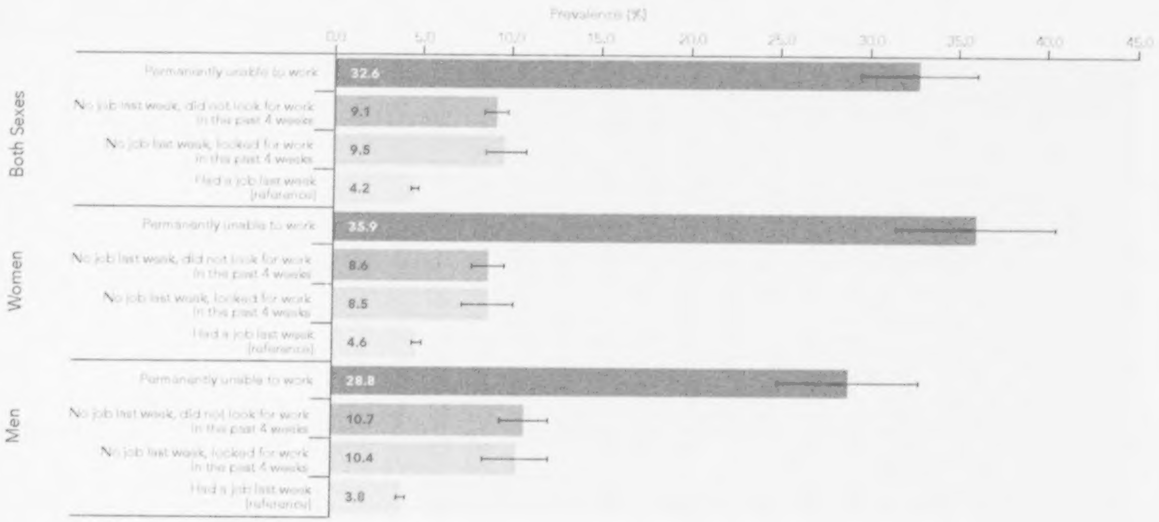


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Less than high school	2.9*	7.2*	65.7*	15.2*	0.9*	238 640*
High school graduate	1.6*	2.3*	37.5*	6.5*	0.4*	101 670*
Some postsecondary	2.1*	4.0*	51.2*	3.9*	0.2*	60 760*
Community college/ Technical school/ University certificate	1.4*	1.6*	30.0*	9.9*	0.6*	155 060*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

FIGURE 5

Low Self-Rated Mental Health by Employment Status and Sex/Gender, Canada, ages 18–75 years, 2010–2013



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Permanently unable to work	7.9*	28.5*	87.3*	12.0*	0.8*	190 840*
No job last week, did not look for work in the past 4 weeks	2.2*	4.9*	54.3*	17.3*	1.1*	275 150*
No job last week, looked for work in the past 4 weeks	2.3*	5.3*	56.2*	3.8*	0.2*	60 280*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Permanently unable to work	7.9*	31.4*	87.3*	12.7*	0.9*	109 180*
No job last week, did not look for work in the past 4 weeks	1.9*	4.0*	46.7*	16.2*	1.1*	138 480*
No job last week, looked for work in the past 4 weeks	1.9*	3.9*	46.1*	2.4*	0.2*	20 260*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Permanently unable to work	7.6*	25.0*	86.9*	10.8*	0.6*	80 780*
No job last week, did not look for work in the past 4 weeks	2.8*	7.0*	64.9*	19.6*	1.2*	147 150*
No job last week, looked for work in the past 4 weeks	2.8*	6.6*	63.8*	5.4*	0.3*	40 820*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category

Age standardization was performed using the 2011 Census of Population.

Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

BOX 1
MENTAL ILLNESS HOSPITALIZATIONS

Mental illness, which encompasses a wide range of disorders, is one of the leading causes of disease burden in Canada (15). In any given year, 1 in 10 Canadians experience a mental illness, and 1 in 3 experience a mental illness in their lifetime (16). The direct cost of mental illness (i.e. the costs of medical care, including hospitalizations, physician care, and prescription drugs) was estimated at $8 billion in 2008 (17), while direct and indirect costs of mental illness to the Canadian economy is estimated at $50 billion per year (18,19).

A significant number of Canadians access the health care system due to mental illness each year. In 2009/2010, 14.4% of Canadians received health services for a mental illness (20). Mental illness can also lead to hospitalization. According to the Hospital Mental Health Database (HMHDB), from 2009 to 2012, Canada's mental illness hospitalization rate among people aged 15 years and older was 521 per 100 000 people (21) and in 2009/2010, there were over 189 000 mental illness–related hospital discharges (21).

Methods

Data come from the Canadian Institute for Health Information 2009–2012 Hospital Mental Health Database (HMHDB) for the Canadian population aged 15 years and older. The hospitalization rate refers to discharges following hospitalizations for 5 selected mental illness conditions (combined): substance-related disorders; schizophrenia, delusional disorders, and non-organic psychotic disorders; mood/affective disorders; anxiety disorders; and selected disorders of adult personality and behaviour.

Findings

There were significant inequalities in mental illness hospitalizations by gender, ethnicity, and various socioeconomic indicators.

- Mental illness hospitalization rates were slightly higher among men than women—558 per 100 000 versus 484 per 100 000, respectively. The relationship between hospitalizations and several variables—income, education, and ethnicity—tended to be stronger for men than for women.
- Canadians living in the areas with the lowest overall income had a mental illness hospitalization rate of 718 per 100 000. This was 2.2 (95% CI: 2.2–2.3) times the rate for those living in areas with the highest overall income. If hospitalization rates among those living in areas with the lowest incomes were the same as those living in areas with the highest incomes, there would be a 55% reduction in the mental illness hospitalization rate among those living in areas with the lowest incomes. This would result in 20 511 fewer hospitalizations annually.
- In areas with a high concentration of people identifying as First Nations, Inuit, and Métis, mental illness hospitalization rates were, respectively, 3.0 (95% CI: 3.0–3.1), 2.2 (95% CI: 2.1–2.3), and 2.1 (95% CI: 2.0–2.2) times the rate in areas with a low concentration of Indigenous people.

In the most materially and socially deprived areas in Canada, the mental illness hospitalization rate was 1 346 per 100 000. This is 5.5 (95% CI: 5.4–5.6) times the rate in the least materially and socially deprived areas. If Canadians living in areas with the greatest deprivation experienced the same hospitalization rate as those living in areas with the least deprivation, there would be an 82% reduction in mental illness hospitalizations among those living in the most deprived areas. This would, potentially, result in 11 085 fewer hospitalizations per year.

DATA GAPS/LIMITATIONS

Data gaps and limitations should be considered to better understand the estimated magnitude of inequalities and for any potential comparison or future monitoring of the reported results. SRMH serves as a validated general indicator of overall mental health (2), yet a self-reported measure may introduce response bias affecting the size of observed inequalities. For example, different cultural factors may affect perceptions or people's comfort in reporting their mental health. These factors may also influence how people respond to this question. If such a response bias is systematic, this could lead to either under- or overestimating the observed inequalities.

The measures quantify the inequalities experienced by social groups who are defined in a largely aggregated way. The distribution of low SRMH prevalence within more refined social groupings was not available. For this reason, these results do not capture the heterogeneous nature of the stratifier groups, potentially concealing other inequalities, particularly those that may exist among immigrants or cultural/racial groups. For example, low SRMH varies significantly between immigrant populations from different countries. Comparing the immigrant population as a whole to the non-immigrant population does not capture the nuances of inequality within and between different immigrant populations and can lead to an over- or underestimation of the health burden these groups face (22). Moreover, the use of a combined cultural and racial background grouping can also lead to an over- or underestimation of prevalence due to classifying heterogeneous groups under a single social categorization (23).

The inequitable distribution of the prevalence of low SRMH within broadly defined social groupings was also not explored. For instance, as the CCHS does not collect information about immigrant landing status (e.g. economic class, family class, refugee status), it was not possible to examine health differences between these different groups of immigrants.

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (13), calculating *p*-values would confirm statistically significant differences.

Finally, given that the data presented are cross-sectional, it is not possible to infer causality. For example, low SRMH prevalence was higher among those unable to work. While this may be because those who were unable to work were at an increased risk of developing low SRMH, it may also be that low SRMH interfered with the ability to be employed. Instead, the current analysis was meant to capture the depth and impact of inequalities in the prevalence of low SRMH on different socially stratified groups at a given point in time.

DISCUSSION

Mental illness is one of the leading causes of disease burden in Canada. Although not a direct measure of mental illness, SRMH is a validated indicator of overall mental health. SRMH is also associated with the presence of some mental disorders as well as psychological distress. Direct international comparisons of the prevalence of poor perceived mental health are difficult due to differences in definitions and sociocultural characteristics that may influence responses to survey questions. However, other countries report similar inequalities in low SRMH according to employment status (24), cultural or racial background (25), and Indigenous identity (26) to those in Canada.

Mental health is not distributed equally across sociodemographic and socioeconomic groups in Canada. The sex/gender differences in SRMH were modest, with a slightly higher proportion of women reporting low SRMH. Biological and socially constructed differences between women and men interact to influence an individual's susceptibility to mental health risks over the life course, as well as health-seeking behaviours and how they report symptoms of mental distress or disorders (27,28). Culturally imposed gender roles can also affect the control that some men and women have over the determinants of their mental health (29).

Low SRMH was most prevalent in adults from lower income quintiles, those with the lowest levels of education, and those permanently unable to work. Income can influence perceived mental health because of its influence on an individual's ability to meet basic needs (29). In turn, adequate income provides options and opportunities that are not available to lower-income households (29). As such, low-income households experience a high incidence and prevalence of mental illness (30). The relationship between low income and poor mental health is thought to result, in part, from increased exposure to adversity and stressors, and fewer resources to cope with them (31).

The relationship between unemployment, higher levels of depression and anxiety, and lower perceived mental health is well documented (32). People who have severe mental illness may be unable to work, which would also contribute to these large inequalities in SRMH by employment status. Moreover, as is the case with income, the prevalence of low SRMH decreases as educational level increases (29). Higher educational attainment—by giving individuals access to better job opportunities and the potential for higher incomes—improves the chances of positive mental health (29). Education may also confer direct benefits on mental health through learned coping skills and mental health literacy associated with higher levels of education (29,33).

Similarly, low SRMH prevalence among people working in unskilled, semiskilled, and skilled technical supervisor positions was, respectively, 2.2, 1.6, and 1.3 times that among those working in professional occupations. A robust literature demonstrates higher levels of job strain, which is associated with poorer mental health outcomes, among lower occupational classes (34).

Marked inequalities among social identities, such as sexual orientation, Indigenous identity, and cultural/racial backgrounds, were also found. Gender expectations, for example, and internalized stress related to discrimination may contribute to the significantly higher prevalence of low SRMH among gay, lesbian, and bisexual people compared with heterosexual people. This stress can also affect health care–seeking behaviour among these populations. Compared with heterosexual adults, lesbian, gay, and bisexual adults are more likely to consult mental health service providers (35) and are more likely to develop a posttraumatic stress disorder or depression, or to attempt suicide (36).

Indigenous peoples in Canada—First Nations living off reserve, Métis, and Inuit—have a prevalence of low SRMH 1.3 to 1.9 times as high as non-Indigenous adults. Indigenous people living in northern and remote regions face particularly challenging situations, such as a lack of clean water or affordable food, which can put them at increased risk for poor mental health (10). Indigenous peoples living in remote and isolated communities also lack access to basic health services, especially those that can address their mental health and well-being needs in a culturally appropriate way (37). More profoundly, First Nations, Métis, and Inuit share a common legacy of colonization. Transgenerational effects of the Indian Residential School system; dislocations and disruptions of a traditional way of life; cultural oppression; loss of autonomy; systematic devaluing of Indigenous identity; and disconnection from the land can lead to increased mental health risk factors (38) (Box 2).

BOX 2

FOCUS ON FIRST NATIONS PEOPLE LIVING ON RESERVE AND IN NORTHERN COMMUNITIES–CONTEXTUALIZING RESULTS FROM THE FIRST NATIONS REGIONAL HEALTH SURVEY

Prepared by the First Nations Information Governance Centre

Mental health is a Western concept that, for First Nations people, can be understood as the degree of balance between the spiritual, physical, emotional, and mental realms (39). This holistic and harmonious outlook on life includes a perception that this balance also depends on people's connection with their community, family, ancestors, and the natural world (40). Thus, First Nations peoples' vulnerability to declines in mental health reflect a disruption to their degree of balance, which is the direct result of spiritual assaults from various colonial policies (41). Notably, government policies spanning from the 1800s to the late 1980s, as well as those affecting the present-day delivery of child welfare services, have meant that generations of First Nations children were taken away from their families and raised in environments devoid of First Nations culture (42). While the separation of children from their families is in itself traumatic, it was and is common for children to experience various types of abuse and limitations in care (e.g. emotional, health). These experiences create barriers to forming adaptive coping mechanisms, developing nurturing relationships, and cultivating parenting skills that assist in promoting mental wellness in future generations (41,43). As a result, many First Nations people experience victimization (e.g., racism) and feelings of disconnection, a lack of belonging, and a lack of trust (e.g. for government institutions, including schools and hospitals) (44,45). This often results in heightened levels of stress and adverse psychological reactions, which may contribute to mental illness (38,42). In addition, the disconnection from culture and creation of government-controlled reserves displaced First Nations people from their connection to the land, their lifestyles, and sources of economic sustenance (e.g., migration for hunting). Coupled with the remote and/or rural nature of many communities, socioeconomic development in many First Nations communities is hindered, and there are fewer opportunities for educational attainment, employment, and accessible health care services. In particular, mental health services are often not available or, if they are accessible, they may not be culturally appropriate, creating additional barriers to restoring balance (44,45).

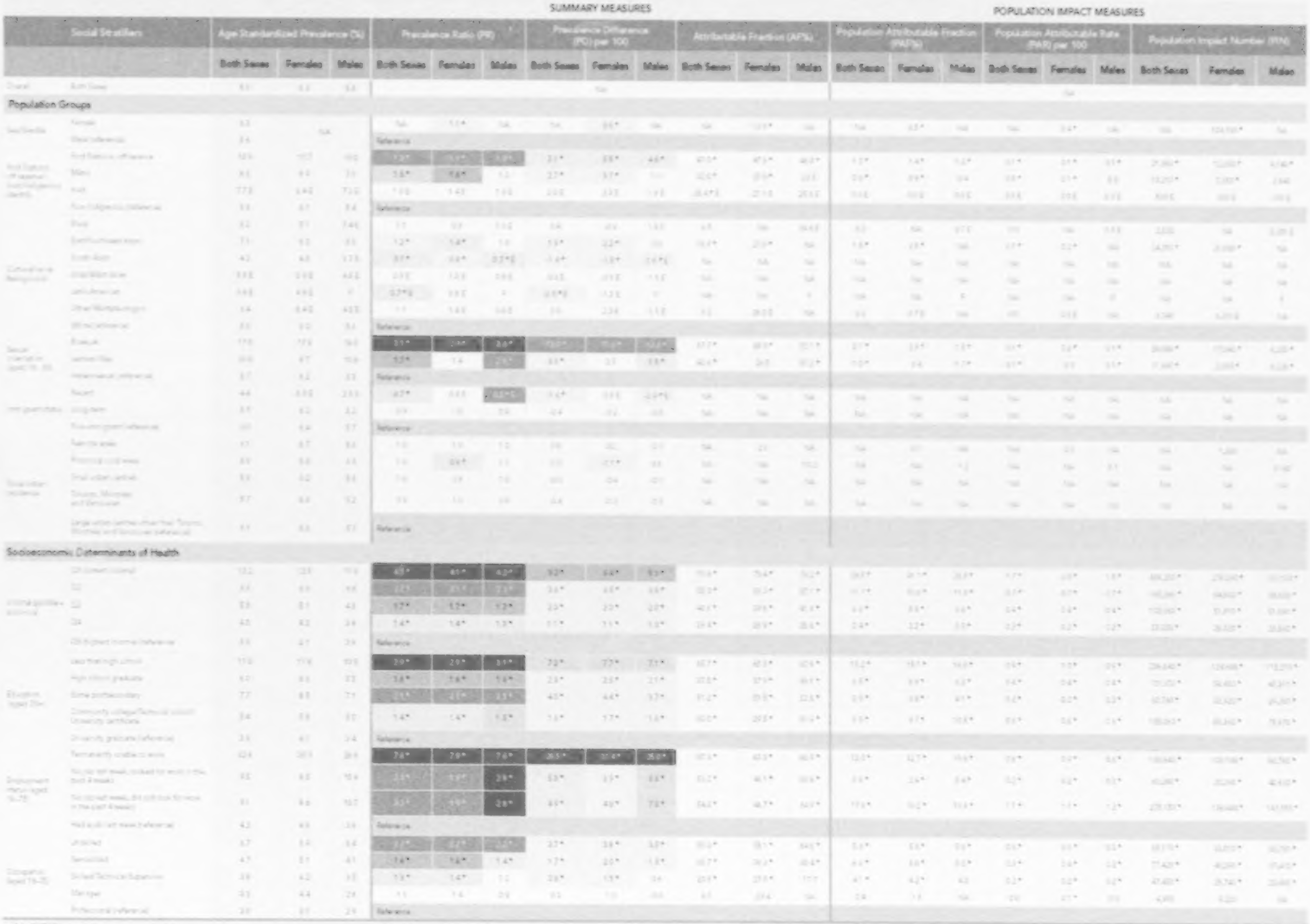
Although immigrants constitute a heterogeneous group with respect to their country of origin, age, historical roots, culture, and health practices, recent immigrants perceived their mental health more positively than did non-immigrants. This is consistent with recent studies that found that a significantly lower percentage of recent immigrants reported poor perceived mental health compared with their Canadian-born counterparts. However, this advantage diminishes after 10 or more years of residence in Canada (46,47). The advantage enjoyed by recent immigrants may, in part, be the result of the "healthy immigrant" effect, where recently immigrated people enjoy better levels of health compared with the native-born population because of immigration screening (48). A recent review found this effect may include the mental health domain, resulting in lower prevalence of poor self-reported mental health or lower prevalence of major depressive episodes. This effect largely disappears after 10 years of living in Canada and does not hold true for all immigrant groups, countries of origin, or waves of immigration (48). The burden of the settlement process (49), acculturation-related stressors, economic uncertainty, and discrimination (50) are among the factors leading to the loss of this health advantage.

Mental health is fundamental to the human ability to live and enjoy life (9). SRMH, as an indicator of overall mental health, reveals an unequal distribution in the population, with inequalities in perceived mental health prevalent across a range of social stratifications, including sexual orientation, employment, and Indigenous identity. There is also a socioeconomic gradient in low SRMH, with rates generally increasing as income, education, and occupational skill level decrease.

Similar inequalities across social determinants measured at the neighbourhood level also exist when examining hospitalizations due to mental illness. While individual risk factors exist, these are greatly affected by environmental, economic, and social factors. The higher prevalence of mental illness hospitalizations in some populations is strongly influenced by social determinants of health.

Addressing these highlighted inequalities through policy interventions that impact broader influences such as socioeconomic status (4), social support (5), community belonging (6), activity restriction, social role functioning (7), and service use (8) will require upstream interventions from the perspective of both the research and action. The systematic measurement of health inequalities of Canadians with low perceived mental health will help to inform and strengthen interventions to reduce revealed differences and related impacts. The ongoing monitoring of health inequalities across sociodemographic and socioeconomic groups will, in turn, inform how these are changing over time and further inform programs, policies, and research to decrease both inequalities and prevalence of perceived mental health.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Low Self-Rated Mental Health.
Data Source: CCHS 2010–2013



Social Stratifiers		Age Standardized Prevalence (%)			Prevalence Ratio (PR)			Prevalence Difference (PD) per 100			Attributable Fraction (AF%)			Population Attributable Fraction (PAF%)			Population Attributable Rate (PAR) per 100			Population Impact Number (PIN)		
		Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males

NOTE:

The purpose of the colour scaling is to map (for all indicators and stratifiers) 1– the relative and absolute inequalities; 2– the patterns of inequalities (e.g. Indigenous populations frequently experience inequalities compared to non–Indigenous); 3– the gradients of inequalities (e.g. there are frequently inequalities in a gradient across income strata). The magnitude and distribution of inequalities shown in this table should be interpreted with caution, taking into consideration one indicator at a time, the differences among the data sources used (e.g. survey vs. administrative register), and existing limitations in the measurement of the social statifiers.

Colour scaling for rate ratios below 1 and rate differences below 0 was applied using the reciprocal value and the absolute value respectively. For example, for a RR of 0.5, the colour scale applicable for the value 2.0 (1/0.5) and for a RD of -10, the colour scale for the value 10 is used. Colour scaling is only applied when the difference between the value and the reference group is statistically significant.

LEGEND

		PR	PD per 100
Non-applicable	NA	> 2.3	> 15.2
Non-reportable	F	1.7 → 2.3	10.5 → 15.2
Report with Caution	E	1.5 → 1.7	7.9 → 10.5
Statistically Significant	*	1.4 → 1.5	5.8 → 7.9
Reference	▨	1.3 → 1.4	4.4 → 5.8
		1.0 → 1.3	0.0 → 4.4

Larger Inequality
↕
Smaller Inequality

Annex 2. Absolute and Relative Inequalities, and Population Impact Measures for Mental Illness Hospitalization.
Data Source: Hospital Mental Health Database, CIHI, 2009–2012

					SUMMARY MEASURES										POPULATION IMPACT MEASURES								
Social Stratifiers		Age-Standardized Rate (per 100 000)			Rate Ratio (RR)			Rate Difference (RD) per 100 000			Attributable Fraction (AF%)			Population Attributable Fraction (PAF%)			Population Attributable Rate (PAR) per 100 000			Population Impact Number (PIN)		
		Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males
Overall	Both Sexes	[illegible]	[illegible]	[illegible]	NA									NA								
Population Groups																						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Socioeconomic Determinants of Health																						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTE:

[illegible]

LEGEND

[illegible]

References

(1) Public Health Agency of Canada. [Internet]. Ottawa (ON): Public Health Agency of Canada; 2014. Mental health promotion: promoting mental health means promoting the best of ourselves [updated 2014 May 06; cited 2017 Sep 07]; [about 2 screens]. Available from: https://www.canada.ca/en/public-health/services/health-promotion/mental-health/mental-health-promotion.html.

(2) Mawani FN, Gilmour H. Validation of self-rated mental health. Health Report. 2010 Sept;21(3):61-75.

(3) Ahmad F, Jhajj AK, Stewart DE, Burghardt M, Bierman AS. Single item measures of self-rated mental health: a scoping review. BMC health services research. 2014 Sept;14(1):398.

(4) Honjo K, Kawakami N, Takeshima T, Tachimori H, Ono Y, Uda H, et al. Social class inequalities in self-rated health and their gender and age group differences in Japan . J Epidemiol. 2006 Dec;16(6):223-32.

(5) Mulvaney-Day N, Alegria M, Sribney W. Social cohesion, social support, and health among Latinos in the United States 2007 S. Soc Sci Med. 2007 Jan;64(2):447-95.

(6) Shields M. Community belonging and self-perceived health (Statistics Canada). Health Rep. 2015 Jun;19(2):51-60.

(7) Fleishman J, Zuvekas S. Global self-rated mental health: associations with other mental health measures and with role functioning. Med Care. 2007 july;45(7):602-9.

(8) Katz S, Kessler R, Frank R, Leaf P, Lin E, Edlund M. The use of outpatient mental health services in the United States and Ontario: The impact of mental morbidity and perceived need for care. Am J Public Health. 1997 July;87(7):1136.

(9) World Health Organization. [Internet]. World Health Organization; 2016 Apr. Mental health: strengthening our response (Fact sheet No. 220) [updated 2016 Available from: http://www.who.int/mediacentre/factsheets/fs220/en/.

(10) Mental Health Commission of Canada. Changing directions, changing lives: The mental health strategy for Canada [Internet]. Calgary, AB: Mental Health Commission of Canada; 2012 Available from: http://strategy.mentalhealthcommission.ca/pdf/strategy-images-en.pdf.

(11) World Health Organization, Calouste Gulbenkian Foundation. Social determinants of mental health. Geneva: World Health Organization; 2014.

(12) Statistics Canada. [Internet]. Perceived mental health by age group and sex (Very good or excellent (%)) [updated 2016 cited 23 November, 2017]; [about 2 screens]. Available from: https://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/health110d-eng.htm.

(13) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(14) Public Health Agency of Canada, Pan-Canadian Public Health Network, Statistics Canada and Canadian Institute for Health Information. [Internet]. 2017-09-13. Pan-Canadian Health Inequalities Data Tool [updated 2017 Available from: http://odesi2.scholarsportal.info/webview/index.jsp?object=http://142.150.190.128:80%2Fobj%2FfStudy%2Fcchs-82M0013-E-2014-Annual-component&mode=documentation&v=2&top=yes.

(15) Institute for Health Metrics and Evaluation. [Internet]. Institute for Health Metrics and Evaluation; What health problems cause the most disability? Available from: http://www.healthdata.org/canada.

(16) Pearson C, Janz T and Ali J. Health at a glance: Mental and substance use disorders in Canada [Internet]. Ottawa, ON: Minister of Industry; 2013 Available from: http://www.statcan.gc.ca/pub/82-624-x/2013001/article/11855-eng.pdf.

(17) Public Health Agency of Canada. The Chief Public Health Officer's report on the state of public health in Canada 2015: Alcohol consumption in Canada [Internet]. Ottawa: Public Health Agency of Canada; 2016 [cited 2017 Feb 15]. Available from: https://www.canada.ca/en/public-health/services/publications/chief-public-health-officer-reports-state-public-health-canada/2015-alcohol-consumption-canada.html.

(18) Smetanin P, Stiff D, Briante C, Adair CE, Ahmad S and Khan M. The Life and Economic Impact of Major Mental Illnesses in Canada: 2011 to 2041 (RiskAnalytica, on behalf of the Mental Health Commission of Canada 2011). 2011 .

(19) Lim K, Jacobs P, Ohinmaa A, Schopflocher D, Dewa CS. A new population-based measure of the economic burden of mental illness in Canada. Chronic Dis Can. 2008;28(3):92-8.

(20) Public Health Agency of Canada. Report from the Canadian chronic disease surveillance system: mental illness in Canada, 2015 [Internet]. Ottawa, ON: Minister of health; 2015 Available from: https://www.canada.ca/content/dam/canada/health-canada/migration/healthy-canadians/publications/diseases-conditions-maladies-affections/mental-illness-2015-maladies-mentales/alt/mental-illness-2015-maladies-mentales-eng.pdf.

(21) Canadian Institute for Health Information. Hospital mental health services in Canada, 2009–2010 [Internet]. Ottawa, ON: Canadian Institute for Health Information; 2012 Available from: https://secure.cihi.ca/free_products/Mental%20Health%20Annual%20Report%202009-2010%20FY_2012_EN-web.pdf.

(22) Chen J, Wilkins R, Ng E. Health expectancy by immigrant status, 1986 and 1991. Health rep. 1996 Winter;8(3):29-38.

(23) Edwards N. Action on the Social and Structural Determinants of Health: Defining a Research Agenda. 2011.

(24) André A. Determinants of self-reported mental health using the British Household Panel Survey. J Ment Health Policy Econ. 2004 Jun;7:99-106.

(25) Jurkowski JM, Westin EL, Rossy-Millan J. Latina self-reported mental health and delay in health care in a new Latino destination. Women Health. 2010 Mar;50(3):213-28.

(26) Jorm AF, Bourchier SJ, Cvetkovski S, Stewart G. Mental health of Indigenous Australians: a review of findings from community surveys. Med J Aust. 2012 Feb;196(2):118-21.

(27) Altemus M. Sex differences in depression and anxiety disorders: potential biological determinants. Horm Behav. 2006;50(4):534-8.

(28) Public Health Agency of Canada. [Internet]. Government of Canada; 2012. The Chief Public Health Officer's report on the state of public health in Canada, 2012: Influencing health – The importance of sex and gender [updated 2012 Available from: http://www.phac-aspc.gc.ca/cphorsphc-respcacsp/2012/index-eng.php.

(29) Government of Canada. The human face of mental health and mental illness in Canada [Internet]. Minister of Public Works and Government Services Canada; 2006 Available from: http://www.phac-aspc.gc.ca/publicat/human-humain06/pdf/human_face_e.pdf.

(30) Sareen J, Afifi TO, McMillan KA, Asmundson GJ. Relationship between household income and mental disorders: findings from a population-based longitudinal study. Arch Gen Psychiatry. 2011 Apr;68(4):419-27.

(31) Orpana HM, Lemyre L, Gravel R. Income and psychological distress: The role of the social environment. Health Rep. 2009 Mar;20(1):21-8.

(32) Pharr JR, Moonie S, Bungum TJ. The impact of unemployment on mental and physical health, access to health care and health risk behaviors. ISRN Public Health. 2011;2012:1-7.

(33) Zimmerman E, Woolf S, Haley A. Understanding the relationship between education and health: A review of the evidence and an examination of community perspectives. Population health. 2015 Sept.

(34) Stansfeld S, Candy B. Psychosocial work environment and mental health—a meta-analytic review. Scand J Work Environ Health. 2006 Dec;32(6):443-62.

(35) Tjepkema M. Health care use among gay, lesbian and bisexual Canadians [Internet]. Toronto, ON: Statistics Canada; 2015 Available from: http://search.proquest.com/docview/207496109/fulltextPDF/A532B5C90FD240C7PQ/1?accountid=27430.

(36) King M, Semlyen J, Tai SS, Killaspy H, Osborn D, Popelyuk D, et al. A systematic review of mental disorder, suicide, and deliberate self harm in lesbian, gay and bisexual people. BMC Psychiatry. 2008 Aug;8(1):70.

(37) Loppie S, Reading C and Wien F. Health inequalities and social determinants of Aboriginal people's health [Internet]. Prince George: National Collaborating Centre for Aboriginal Health; 2009 [cited 2017 Sep 09]. Available from: http://www.nccah-ccnsa.ca/docs/social%20determinates/nccah-loppie-wien_report.pdf.

(38) Kirmayer LJ, Brass GM, Tait CL. The mental health of Aboriginal peoples: Transformations of identity and community. The Canadian Journal of Psychiatry. 2000;45(7):607-16.

(39) Lavallee LF, Poole JM. Beyond recovery: Colonization, health and healing for Indigenous people in Canada. International Journal of Mental Health and Addiction. 2010;8(2):271-81.

(40) Dumont J. First Nations regional longitudinal health survey (RHS) cultural framework. 2005.

(41) Wilk P, Maltby A, Cooke M. Residential schools and the effects on Indigenous health and well-being in Canada—a scoping review. Public Health Rev. 2017;38(1):8.

(42) Hackett C, Feeny D, Tompa E. Canada's residential school system: measuring the intergenerational impact of familial attendance on health and mental health outcomes. J Epidemiol Community Health. 2016 Nov;70(11):1096-105.

(43) Tait C, Henry R, Walker RL. Child welfare: A social determinant of health for Canadian First Nations and Métis children. Pimatisiwin: A Journal for Aboriginal and Indigenous Community Health. 2013;11(1):39-53.

(44) Nelson S. Challenging hidden assumptions: Colonial norms as determinants of Aboriginal mental health [Internet]. Prince George: National Collaborating Centre for Aboriginal Health; 2012 [cited 2017 Sep 29]. Available from: https://www.ccnsa-nccah.ca/docs/determinants/FS-ColonialNorms-Nelson-EN.pdf.

(45) Loppie S, Reading C and de Leeuw S. Aboriginal experiences with racism and its impacts [Internet]. Prince George: National Collaborating Centre for Aboriginal Health; 2014 [cited 2017 Sep 29]. Available from: https://www.ccnsa-nccah.ca/docs/determinants/FS-AboriginalExperiencesRacismImpacts-Loppie-Reading-deLeeuw-EN.pdf.

(46) Lou Y, Beaujot R. What happens to the 'Healthy immigrant effect': the mental health of immigrants to Canada. PSC Discussion Papers Series. 2005;19(15):1.

(47) Bergeron P, Auger N, Hamel D. Weight, general health and mental health: status of diverse subgroups of immigrants in Canada. Can J Public Health. 2009 May-Jun;100(3):215-20.

(48) Islam F. Examining the "Healthy Immigrant Effect" for mental health in Canada. UTMJ. 2013 May;90(4):169.

(49) Robert A, Gilkinson T. Mental health and well-being of recent immigrants in Canada: Evidence from the longitudinal survey of immigrants to Canada. 2012.

(50) George U, Thomson MS, Chaze F, Guruge S. Immigrant mental health, a public health issue: Looking back and moving forward. International journal of environmental research and public health. 2015;12(10):13624-48.

HEALTH OUTCOMES

CAUSE-SPECIFIC OUTCOMES

INEQUALITIES IN
ARTHRITIS IN CANADA

INEQUALITIES HIGHLIGHTS

- Adults who are permanently unable to work have 21.6 more cases of arthritis per 100 Canadian adults than those who are employed. The prevalence of arthritis among adults who are permanently unable to work is 2.8 times this prevalence among employed adults.
- Adults with less than a high school education have a prevalence of arthritis 1.7 times that of university graduates. This equals 8.5 more cases of arthritis among people with less than a high school education compared with university graduates per 100 Canadian adults.
- First Nations adults living off reserve and Métis adults have 9.4 and 9.2 more cases of arthritis, respectively, compared with non-Indigenous adults per 100 Canadian adults. The prevalence of arthritis is 1.6 times that of non-Indigenous adults for both Indigenous populations.
- The prevalence of arthritis among women is 1.5 times the prevalence among men. This means that there are 6.5 more women with arthritis than men per 100 Canadian adults.
- The prevalence of arthritis among lesbian women is 1.5 times the prevalence among heterosexual women. This equals 5.6 more cases of arthritis among lesbian women than among heterosexual women per 100 Canadian women.
- Compared with adults in professional occupations, adults in unskilled occupations have 4.6 more cases of arthritis per 100 Canadian adults whereas those in semiskilled occupations had 2.9 more cases of arthritis per 100 Canadian adults. This is 1.4 and 1.3 times the prevalence of arthritis of those in professional occupations.
- Recent immigrants (≤10 years in Canada) have a prevalence of arthritis that is 0.6 times that of adults born in Canada. That means there are 7.5 fewer cases of arthritis among recent immigrant adults than among Canadian-born adults per 100 Canadian adults.

ACRONYM	FULL NAME
CCHS	Canadian Community Health Survey
CI	Confidence Interval
CMA	Census Metropolitan Areas
FNIGC	First Nations Information Governance Centre
RHS	First Nations Regional Health Survey

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Arthritis refers to inflammation of the joints and includes more than 100 rheumatic diseases and conditions that affect the joints, the tissues that surround the joints, and other connective tissues. (1). The most common symptoms of arthritis are joint pain, stiffness, and fatigue (1), which can result in reduced quality of life, significant disability (2), and, in some cases, contribute to a premature death (3). Some forms of arthritis, such as rheumatoid arthritis and lupus, are systemic conditions that affect body organs as well as the joints (1).

Arthritis, which also includes osteoarthritis and gout, is one of the most common chronic health conditions affecting Canadians (1). The number of Canadians with arthritis is expected to increase in the coming decades, from 4.6 million in 2011 to about 7.5 million (1 in 5 Canadians) in 2036 (2).

The economic burden of three leading forms of arthritis (osteoarthritis, rheumatoid arthritis, and gout), including direct costs (i.e. hospital care and drugs) and indirect costs (i.e. mortality alone), was about $1.4 billion in 2008 in Canada (4). Osteoarthritis, the most common form of arthritis, is responsible for over 90% of knee replacement surgeries in Canada (5).

Arthritis was selected as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter.)

Nonmodifiable risk factors for arthritis include age, sex, and genetics. Being overweight or obese increases the risk of osteoarthritis, as do joint injuries and occupations involving repetitive bending at the joints or tasks (1,6). Smoking increases the risk of rheumatoid arthritis. Environmental factors may also play a role in the development of some kinds of arthritis (7). Many modifiable risk factors (e.g. smoking, obesity) are also associated with social determinants of health (e.g. income, education). Higher rates of arthritis have been reported by individuals living in areas with high levels of poverty (8).

METHODS

Data on arthritis prevalence and stratifier variables were collected through the Canadian Community Health Survey (CCHS) between 2010 and 2013. Relevant responses were gathered from survey participants 18 years and older who reported being diagnosed as having arthritis (excluding fibromyalgia) by a health professional. Respondents were asked whether the condition was expected to last or had already lasted 6 months or longer.

The analysis included CCHS respondents 18 years and older. Inequalities in prevalence of arthritis were assessed by examining differences in arthritis according to social stratifiers grouped under socioeconomic and sociodemographic stratifiers collected through the CCHS. Sociodemographic stratifiers include sex/gender, Indigenous identity, cultural/racial background, immigrant status, sexual orientation (ages 18–59 years)[23], and rural/urban residence. Socioeconomic stratifiers include income, education (ages 20+ years), occupation, and employment status (ages 18–75 years). Prevalence data were age-standardized using the 2011 Canadian Census of Population.

For the Indigenous identity stratifier, the CCHS sampling frame captures information on Indigenous people who identify as Inuit, Métis, or First Nations living off reserve, but excludes First Nations people living on reserve and Inuit in the Quebec region of Nunavik. For First Nations people living on reserve and in northern communities, information on arthritis is collected by the First Nations Information Governance Centre (FNIGC) and its regional partners through the First Nations Regional Health Survey (RHS). This chapter uses RHS data from 2008 to 2010 for respondents aged

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[23] The CCHS does not collect data on sexual orientation from individuals over the age of 59.

18 years and older, age standardized using the 2011 Census of Population. Like the CCHS, the RHS asked whether the respondent was ever diagnosed with arthritis by a health professional. However, because the RHS neither excluded fibromyalgia nor asked whether the condition was expected to last or had already lasted 6 months or longer, results are not directly comparable with those of the CCHS.

> Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported along with the corresponding 95% confidence intervals (CI). Statistical significance was assessed using 95% confidence intervals (9). Sex/gender-specific inequalities for all of the social stratifiers were also calculated, but reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable fraction, population attributable rate, and population impact number. However, due to methodological limitations in combining two datasets (i.e. CCHS and RHS), results for First Nations people living on reserve and in northern communities were not included in the calculation of inequality measures and are reported here in terms of prevalence only.

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in Canada. (For more detailed information, see the Methodology chapter.)

FINDINGS

The overall prevalence of arthritis in the Canadian adult population 18 years and older for the years 2010 to 2013 was 16.9% (95% CI: 16.7–17.1%). Many social groups experienced inequalities in the burden of arthritis (Annex 1). (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Sex/Gender

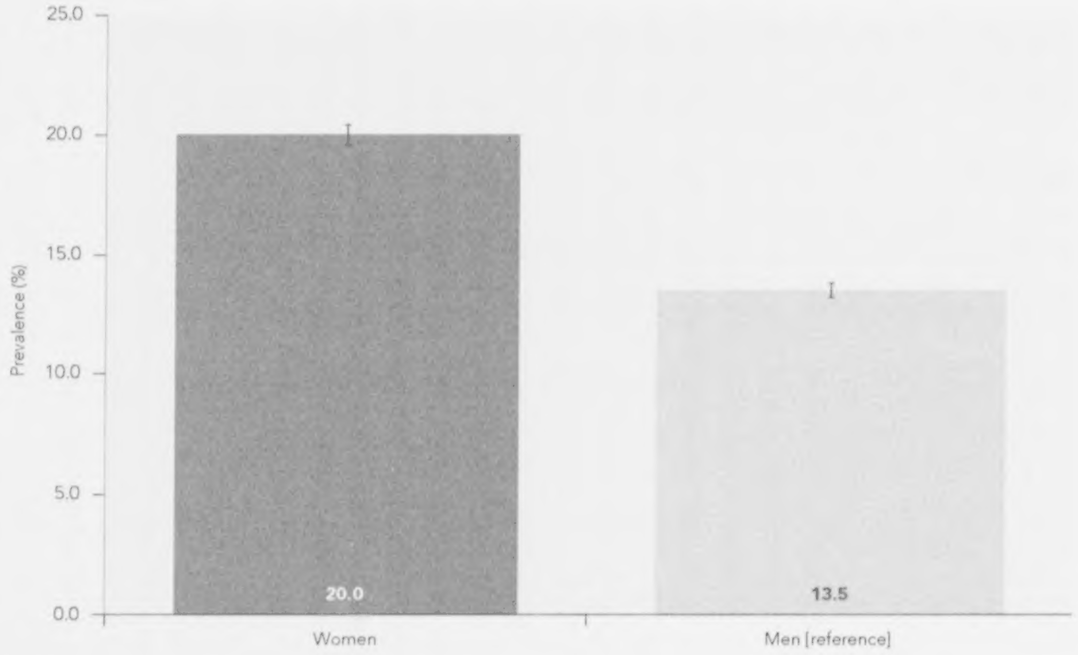
The prevalence of arthritis among women (20.0%; 95% CI: 19.6–20.4%) was 1.5 times that of men (13.5%; 95% CI: 13.2–13.8%) (Figure 1).

Indigenous Peoples

Compared with non-Indigenous adults, who have a prevalence of arthritis of 16.6% (95% CI: 16.4–16.9%), 26.0% (95% CI: 24.1–28.0%) of First Nations people living off reserve had been diagnosed with arthritis. Among First Nations people living on reserve and in northern communities, 25.2% (95% CI: 24.0–26.4) of First Nations people living on reserve had been diagnosed with arthritis, according to the 2008–2010 RHS.[34] The prevalence of arthritis was 25.8% (95% CI: 23.6–28.1%) among Métis adults and 21.1% (95% CI: 15.7–26.4%) among Inuit adults. While Inuit had the lowest prevalence of arthritis among Indigenous peoples, this difference was not statistically significant (Figure 2).

FIGURE 1

Arthritis by Sex/Gender, Canada, ages 18+ years, 2010–2013

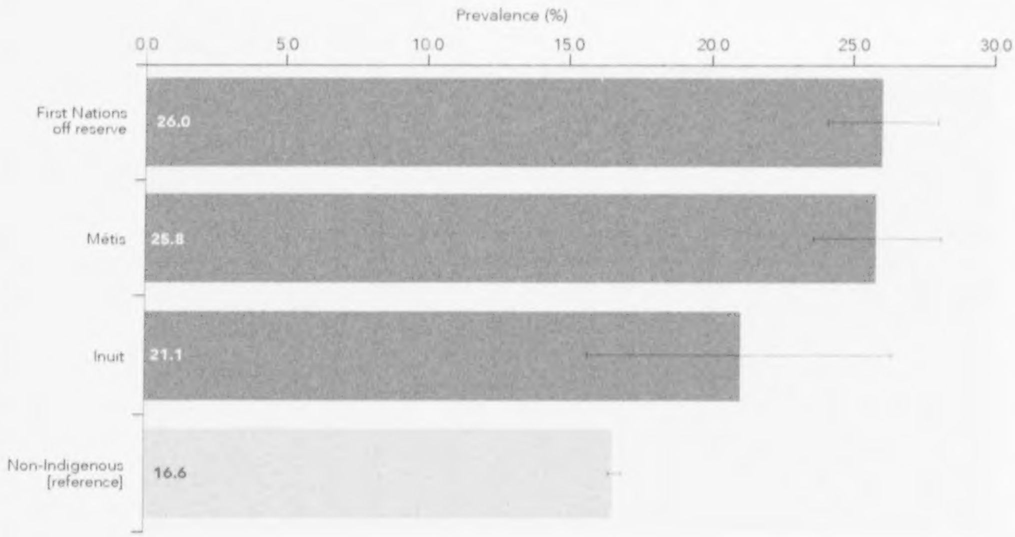


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Women	1.5*	6.5*	32.6*	19.7*	3.3*	893 170*
Men [reference]	1.0	0.0	0.0	0.0	0.0	0

* Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

FIGURE 2

Arthritis by Indigenous Identity, Canada, ages 18+ years, 2010–2013



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
First Nations off reserve	1.6*	9.4*	36.1*	0.9*	0.1*	39 310*
Métis	1.6*	9.2*	35.7*	0.8*	0.1*	34 430*
Inuit	1.3	4.4	21.0*	0.0	0.0	1 260
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0

* Significantly different from reference category

Age standardization was performed using the 2011 Census of Population.

Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

Compared with non-Indigenous adults, First Nations adults living off reserve had 9.4 (95% CI: 7.4–11.4%) more cases of arthritis per 100 Canadian adults and Métis adults had 9.2 (95% CI: 6.9–11.5%) more cases of arthritis per 100 Canadian adults.

If First Nations adults living off reserve had the same prevalence of arthritis as non-Indigenous adults, there would be a 36.1% (95% CI: 31.1–41.1%) reduction in arthritis prevalence among First Nations peoples living off reserve. Similarly, if Métis adults had the same prevalence of arthritis as non-Indigenous adults, the prevalence of arthritis in this population would be reduced by 35.7% (95% CI: 29.8–41.5%).

If First Nations adults living off reserve and Métis adults had the same prevalence of arthritis as non-Indigenous adults, there would be 39 310 (95% CI: 30 820–47 800) and 34 430 (95% CI: 25 330–43 520) fewer cases of arthritis in the adult population in Canada.

Cultural/Racial Background

Arthritis tends to be more prevalent among White and Latin American adults than among other cultural/racial groups in Canada, at 17.3% (95% CI: 17.0–17.6%) and 18.1% (95% CI: 14.1–22.2%), respectively. The lowest prevalence of arthritis was found among East/Southeast Asian adults, at 10.7% (95% CI: 9.5–11.9%), followed by South Asian adults at 12.4% (95% CI: 10.7–14.2%) and Black adults at 14.7% (95% CI: 12.5–16.9%). The prevalence of arthritis among East/Southeast Asian adults was 0.6 (95% CI: 0.6–0.7) times that of White adults; among South Asian adults, 0.7 (95% CI: 0.6–0.8) times that of White adults; and among Black adults, 0.8 (95% CI: 0.7–1.0) times that of White adults. Differences between White and Latin Americans or Arab/West Asian adults were not statistically significant (Figure 3).

Sexual Orientation (ages 18–59 years)

The prevalence of arthritis among Canadian adults who identified as bisexual was 13.3% (95% CI: 10.2–16.4%). This was 1.4 (95% CI: 1.1–1.8) times the prevalence among those who identified as heterosexual (Figure 4) This means there were 4.1 (95% CI: 1.0–7.2) more cases of arthritis among bisexual adults than among heterosexual adults per 100 adults (Figure 4).

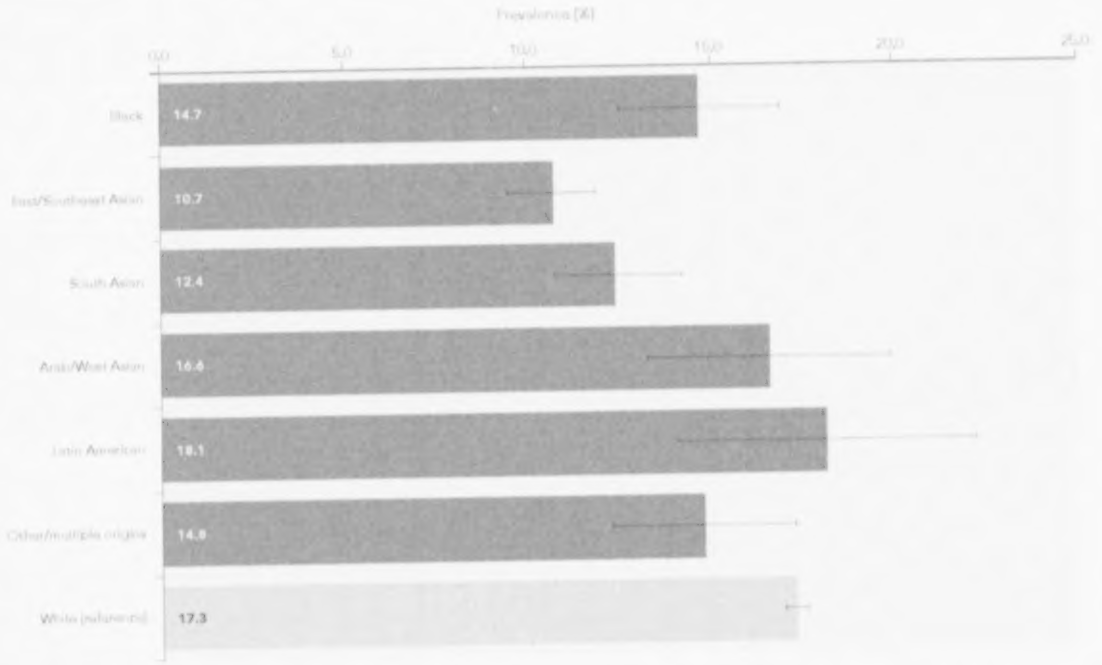
If the prevalence of arthritis was the same among bisexual adults as among heterosexual adults, there would be a 30.7% (95% CI: 14.7–46.7%) reduction in this prevalence among bisexual adults. This would result in 8 440 (95% CI: 2 040–14 840) fewer case of arthritis in Canada.

The prevalence of arthritis among women (ages 18–59 years) who identified as lesbian was 16.5% (95% CI: 12.5–20.4%). This was 1.5 (95% CI: 1.2–1.9) times the prevalence of arthritis among heterosexual women (Table 2). This equates to 5.6 (95% CI: 1.6–9.6) more cases of arthritis among lesbian women than among heterosexual women per 100 adults (Figure 4).

If the prevalence of arthritis among lesbian women was the same as among heterosexual women, there would be a 34% (95% CI: 17.0–51.0%) reduction in this prevalence among lesbian women. There was no statistically significant difference in the prevalence of arthritis for men who identified as gay compared with heterosexual men.

FIGURE 3

Arthritis by Cultural/Racial Background, Canada, ages 18+ years, 2010–2013

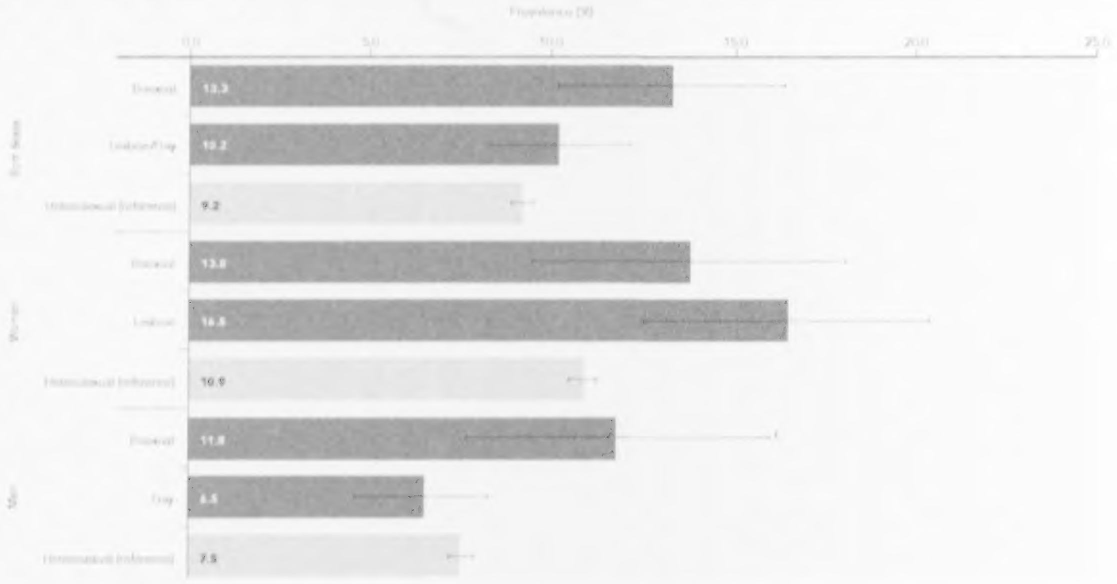


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Black	0.8*	−2.6*	NA	NA	NA	NA
East/Southeast Asian	0.6*	−6.6*	NA	NA	NA	NA
South Asian	0.7*	−4.9*	NA	NA	NA	NA
Arab/West Asian	1.0	− 0.7	NA	NA	NA	NA
Latin American	1.0	0.8	4.5	0.1	0.0	2 870
Other/multiple origins	0.9	− 2.5	NA	NA	NA	NA
White [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
* Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

FIGURE 4

Arthritis by Sexual Orientation and Sex/Gender, Canada, ages 18–59 years, 2010–2013



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Bisexual	1.4*	4.1*	30.7*	0.5*	0.0*	8 440*
Lesbian/Gay	1.1	1.0	9.9	0.1	0.0	2 710
Heterosexual [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Bisexual	1.3	3.0	21.4	0.4	0.0	4 330
Lesbian	1.5*	5.6*	34.0*	0.5*	0.1*	5 680*
Heterosexual [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Bisexual	1.6^{*E}	4.3^{*E}	36.4^{*E}	0.3^{*E}	0.0^{E}	$2\,590^{*E}$
Gay	0.9	−1.1	NA	NA	NA	NA
Heterosexual [reference]	1.0	0.0	0.0	0.0	0.0	0

E: Reportable with caution
* Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

Immigrant Status

The prevalence of arthritis among recent immigrant adults (≤10 years in Canada) was 10.3% (95% CI: 8.1–12.4%), about half that of non-immigrant adults (prevalence ratio [PR] = 0.6; 95% CI: 0.5–0.7). Among long-term immigrant adults (>10 years in Canada), the prevalence of arthritis was 15.1% (95% CI: 14.4–15.7%), which was 0.8 (95% CI: 0.8–0.9) times the prevalence among non-immigrant adults, at 17.8% (95%CI: 17.5–18.1%) (Annex 1).

Income

The relationship between income and arthritis was inverse—as income increased, the prevalence of arthritis decreased. The prevalence of arthritis among adults in the lowest income quintile was 21.2% (95% CI: 20.5–21.9%), which was 1.5 (95% CI: 1.4–1.6) times the prevalence of arthritis among adults in the highest income quintile. This equates to 7.0 (95% CI: 6.2–7.8) more arthritis cases per 100 adults in the lowest income quintile compared with those in the highest income quintile. The prevalence of arthritis in adults in the second, third, and fourth quintiles was, respectively, 17.8% (95% CI: 17.3–18.4%), 16.5% (95% CI: 15.9–17.0%), and 15.3% (95% CI: 14.8–15.8%)—or 1.3 (95% CI: 1.2–1.3), 1.2 (CI: 1.1–1.2), and 1.1 (95% CI: 1.0–1.1) times the prevalence of arthritis among adults in the highest income quintile (Figure 5).

If the prevalence of arthritis among adults in the lowest income quintile was as low as that among adults in the highest income quintile, there would be a 33.1% (95% CI: 29.9–36.2%) reduction in the proportion of adults with arthritis in the lowest income quintile and a 7.8% (95% CI: 6.9– 8.7%) reduction in the proportion of adults with arthritis overall. This would result in 356 430 (95% CI: 314 990–397 860) fewer cases of arthritis in Canada.

If the prevalence of arthritis for adults in the lowest income quintile was as low as for adults in the highest quintile, there would be 356 430 fewer cases of arthritis in Canada.

Education (ages 20+ years)

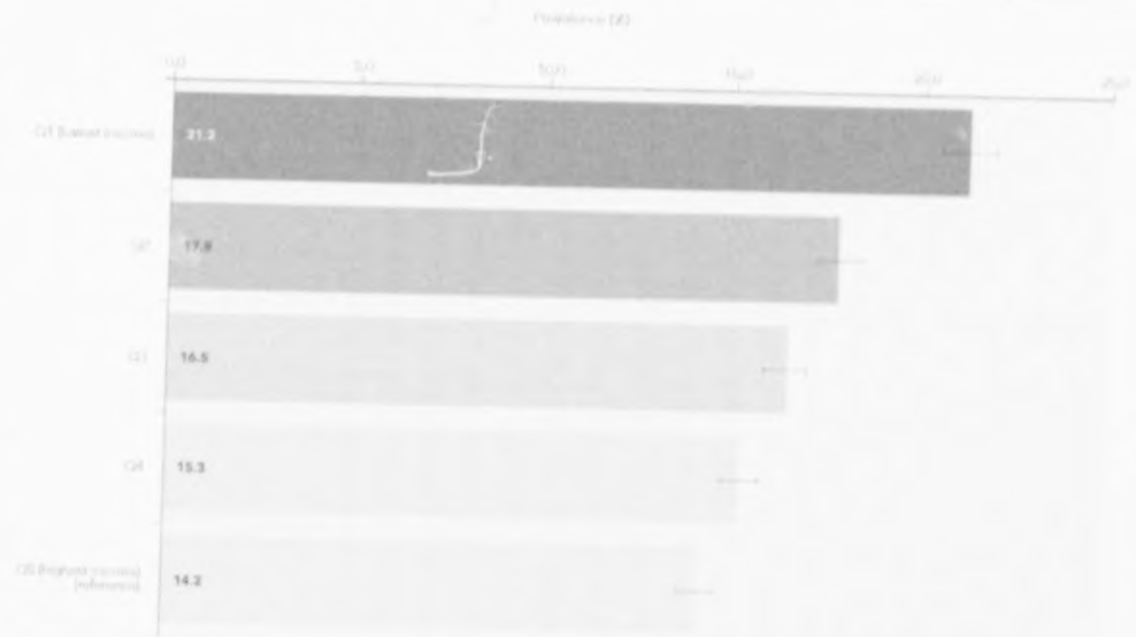
Arthritis prevalence among adults with less than a high school education was 21.6% (95% CI: 20.9–22.4%)—1.7 (95% CI: 1.6–1.7) times the prevalence among university graduates (Figure 6).

If the prevalence among adults with the lowest level of education was the same as for university-educated adults, there would be a 39.5% (95% CI: 36.3–42.7%) reduction in prevalence of arthritis among adults who had not completed high school. There would also be a 6.5% (95% CI: 5.8–7.1%) decrease in the overall national prevalence of arthritis, which would result in 293 200 (95% CI: 262 210–324 200) fewer reported cases of arthritis.

If the prevalence of arthritis among adults with less than high school education was the same as for university-educated adults, there would be 293 200 fewer cases of arthritis in Canada.

FIGURE 5

Arthritis by Income Quintile, Canada, ages 18+ years, 2010–2013

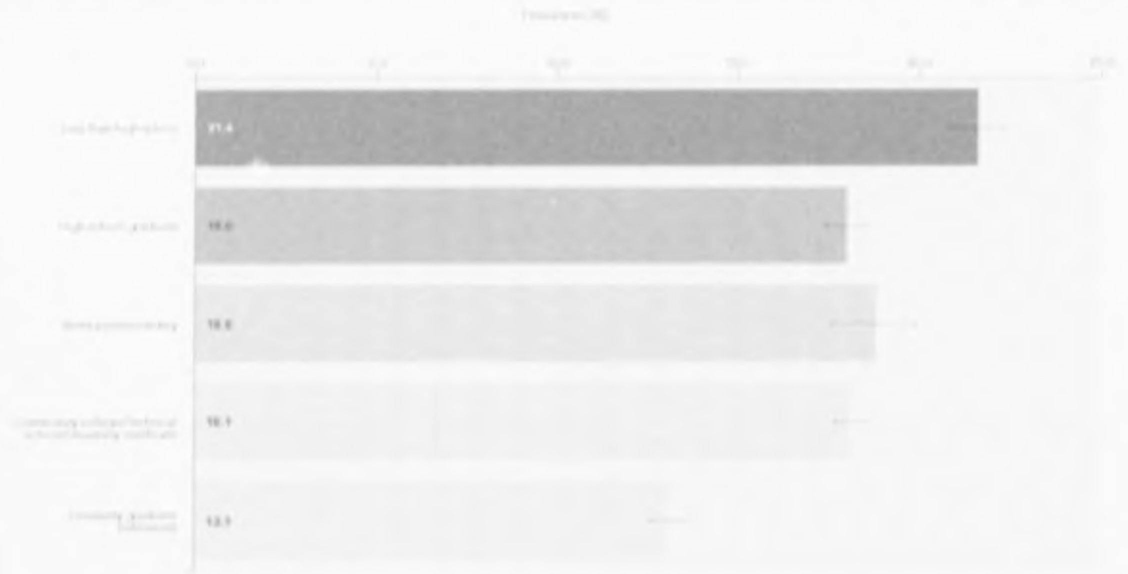


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Q1 (lowest income)	1.5*	7.0*	33.1*	7.8*	1.3*	356 430*
Q2	1.3*	3.7*	20.5*	4.1*	0.7*	186 520*
Q3	1.2*	2.3*	13.9*	2.6*	0.4*	116 850*
Q4	1.1*	1.1*	7.4*	1.3*	0.2*	58 800*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
* Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

FIGURE 6

Arthritis by Education Level, Canada, ages 20+ years, 2010–2013



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Less than high school	1.7*	8.5*	39.5*	6.5*	1.1*	293 200*
High school graduate	1.4*	5.0*	27.5*	4.9*	0.9*	223 540*
Some postsecondary	1.4*	5.7*	30.4*	1.9*	0.3*	86 800*
Community college/ Technical school/ University certificate	1.4*	5.0*	27.6*	10.5*	1.8*	475 630*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0

* Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010-2013

The prevalence of arthritis among high school graduates was 18.0% (95% CI: 17.4–18.6%)—1.4 (95% CI: 1.3–1.5) times the prevalence among university graduates. Inequalities in prevalence of arthritis were more pronounced among men with a community college, technical school, or university education. Men with these qualifications had an arthritis prevalence 1.5 (95% CI: 1.4–1.6) times that of men who were university graduates; women with these qualifications, on the other hand, had an arthritis prevalence 1.3 (95% CI: 1.2–1.3) times that of women who were university graduates (Annex 1).

Employment Status and Occupation

The prevalence of arthritis among adults permanently unable to work was 33.9% (95% CI: 31.6–36.1%). This was 2.8 (95% CI: 2.6–3.0) times the prevalence of arthritis among employed adults (i.e. those who had a job in the previous week) (Figure 7). This translates into 21.6 more cases of arthritis per 100 adults permanently unable to work compared with employed adults.

If the prevalence of arthritis among adults permanently unable to work was the same as that among employed adults, there would be a 63.9% (95% CI: 61.3–66.4%) reduction in the prevalence of arthritis among those permanently unable to work. There would also be a 4.5% (95% CI: 4.0–5.0%) decrease in overall prevalence of arthritis in Canada and 158 350 (95% CI: 139 890–176 810) fewer cases of arthritis.

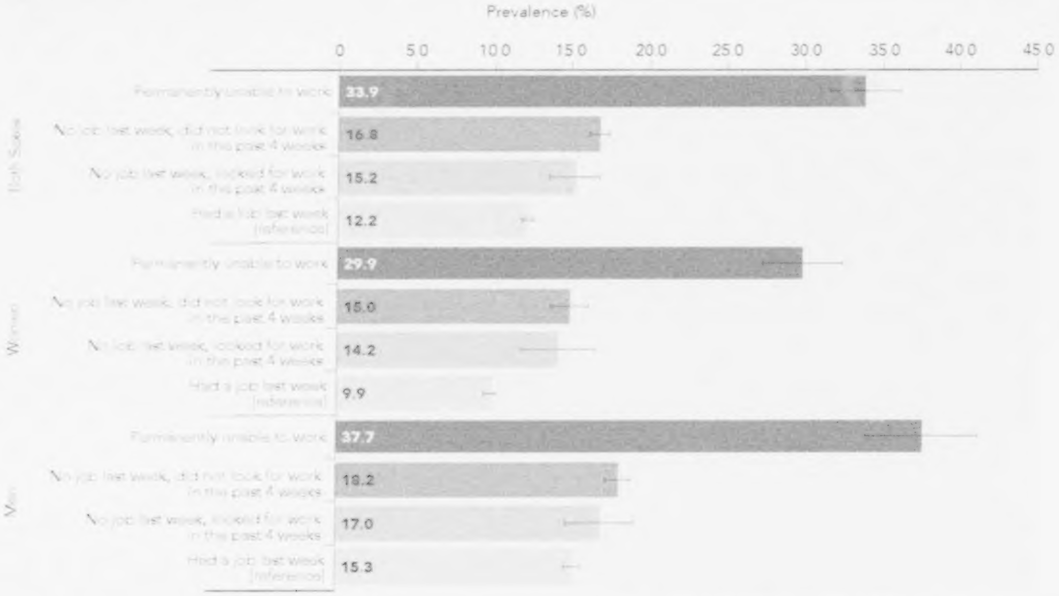
The inequality in prevalence of arthritis was more pronounced among men in all the employment status categories compared with the reference group. For example, the prevalence among men who were permanently unable to work was 3.0 (95% CI: 2.7–3.3) times that of employed men, whereas the prevalence of arthritis among women in this group was 2.5 (95% CI: 2.2–2.7) times that of employed women.

Adults in unskilled and semiskilled occupations had prevalence of arthritis 1.4 (95% CI: 1.3–1.6) and 1.3 (95% CI: 1.2–1.4) times this prevalence among professionals. The prevalence of arthritis among people who identified as skilled/technical/supervisors was 1.2 (95% CI: 1.1–1.3) times that of professionals. The prevalence of arthritis among managers was comparable to that of professionals (Annex 1).

If adults in unskilled occupations had the same prevalence of arthritis as those in professional occupations, there would be a 30.5% (95% CI: 22.2–38.8%) reduction in this prevalence among workers in unskilled occupations. The magnitude of inequalities according to occupation was similar for men and women.

FIGURE 7

Arthritis by Employment Status and Sex/Gender, Canada ages 18–75 years, 2010–2013



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Permanently unable to work	2.8*	21.6*	63.9*	4.5*	0.6*	158 350*
No job last week, did not look for work in the past 4 weeks	1.4*	4.5*	26.9*	7.1*	1.0*	252 170*
No job last week, looked for work in the past 4 weeks	1.2*	3.0*	19.6*	0.9*	0.1*	33 420*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Permanently unable to work	2.5*	22.5*	59.5*	3.9*	0.7*	84 170*
No job last week, did not look for work in the past 4 weeks	1.2*	2.9*	16.1*	4.7*	0.8*	101 280*
No job last week, looked for work in the past 4 weeks	1.1	1.7	10.1	0.4	0.1	8 740
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Permanently unable to work	3.0*	20.0*	66.8*	4.9*	0.6*	71 510*
No job last week, did not look for work in the past 4 weeks	1.5*	5.1*	34.0*	7.6*	0.9*	109 340*
No job last week, looked for work in the past 4 weeks	1.4*	4.3*	30.3*	1.8*	0.2*	26 110*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0

* Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

Rural/Urban Residence[25]

Adults living in the large census metropolitan areas (CMAs) of Toronto, Montréal, and Vancouver had prevalence of arthritis of 14.3% (95% CI: 13.8–14.8%). This was 0.8 (95% CI: 0.8–0.8) times that of residents of other CMAs (large urban centres other than Toronto, Montréal, and Vancouver) (Annex 1).

DATA GAPS/LIMITATIONS

Data gaps and limitations should be considered to better understand the estimated magnitude of inequalities and for any potential comparison or future monitoring of the reported results.

Although most chronic health conditions are reasonably accurately self-reported when compared with medical records, over- and under-reporting of arthritis is common and differs between women and men. For example, evidence suggests that older women over-report and older men under-report arthritis (10). In addition, differences in arthritis risk according to subtypes of arthritis were not available via the CCHS. As mentioned earlier, arthritis refers to more than 100 different disease/conditions, yet the CCHS did not collect information on the various types. It is possible that individual types of arthritis are associated with different magnitudes of inequalities; analyzing the data for all forms of arthritis together may have obscured some of these relationships. Moreover, data collected for arthritis and other chronic conditions assumes diagnostics by a health professional; this is often harder to get in remote communities due to reduced access to health professionals, thus affecting the size of inequalities reported for population groups by Indigenous identity or rural/urban residence.

Given that the data presented are cross-sectional, it is not possible to infer causality. For example, arthritis prevalence was higher among CCHS respondents who were unable to work. While this may be because those who were unable to work were at an increased risk of developing arthritis, it may also be that arthritis interfered with their ability to work or seek work. The current analysis was meant to capture the depth and impact of inequalities in arthritis prevalence on different socially stratified groups at a given point in time.

The measures quantify the inequalities experienced by defined social groups, albeit in a limited way. The inequalities facing individuals and communities who hold multiple and intersecting identities are not captured here. The inequitable distribution of the prevalence of arthritis within broadly defined social groupings is also not explored. The disproportionate burden of arthritis of certain groups is driven by a complex system of social and structural drivers of health that remain to be fully explored and understood.

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (9), calculating *p*-values would confirm statistically significant differences.

In addition, results do not capture the heterogeneous nature of some social groups. For instance, comparing the immigrant population as a whole to the non-immigrant population does not capture the nuances of inequality within and between different immigrant populations and can lead to an over- or underestimation of the health burden these groups face (11). For example, the prevalence of arthritis varies significantly between immigrant populations from different source countries (12). Cultural differences in the understanding of survey questions and language barriers also merit careful consideration.

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[25] For definition of rural/urban subgroups, see the Methodology chapter.

DISCUSSION

Arthritis was more prevalent among women than men. Similar findings have been reported from Australia (13) and the United States of America (14). Higher risks may relate to differences in biology, in exposure to risk factors, in over- and under-reporting, and in diagnosis-seeking behaviours (10).

Adults who were permanently unable to work had almost 3 times the prevalence of arthritis compared with employed adults. Arthritis is a major cause of disability resulting in unemployment. A Canadian report indicated that over 70% of individuals aged 55 to 64 years who had arthritis were not in the labour force (1). Another Canadian study showed that osteoarthritis, after adjusting for sociodemographic factors, is independently associated with higher risk of work loss because of disability or illness (15). Similarly, 18% of employed Americans reported having been diagnosed with arthritis compared with 27% who were not employed but who had worked previously (14).

First Nations adults living off reserve and Métis adults had a 60% higher prevalence of arthritis than non-Indigenous adults. Studies in Alberta indicated that some kinds of arthritis, such as rheumatoid arthritis and systemic lupus erythematosus, were more prevalent in the First Nations population than other populations (16,17). In New Zealand, Maori adults were 1.3 times more likely to have arthritis than non-Maori adults (18). Compared with the general population in the United States, a higher prevalence of arthritis was reported among Alaska Native populations, but not among American Indians living in the Southwest (19).

The association between arthritis and educational attainment is well-documented (20). Because arthritis can affect all ages, it may contribute to a lower level of education just as a lower educational attainment contributes to an increased risk of arthritis. Low educational level has also been reported to be a significant factor for arthritis outcomes such as pain and physical function (8).

There is a clear relationship between income and the prevalence of arthritis in Canada. Similarly, in the United States, 25% of people who were "poor" reported having arthritis compared with 20% who were "not poor" (14). In New Zealand, adults living in the most socioeconomically deprived areas had higher rates of arthritis (18).

Similar to our findings, a national study of adults in the USA found a statistically significantly higher prevalence of arthritis among lesbian women compared with heterosexual women (36.3% vs 24.2%) (27). Another regional study reported a statistically nonsignificant elevated risk of arthritis among lesbian and bisexual women aged 50 years and over compared with heterosexual women in the same age range (adjusted odds ratio 1.29 (95% CI: 0.99–1.67) (28).

In Sweden, manual workers together with assistant and intermediate non-manual workers had an almost 20% greater risk of developing rheumatoid arthritis than "higher status" non-manual workers (29). Similarly, a recent review reported higher rates and worse outcomes for osteoarthritis among nonprofessional occupations (8).

The lower prevalence of arthritis among recent immigrants may be partly due to the "healthy immigrant" effect, that is, the better health status of immigrants upon arrival in a country compared with the locally born population (1). Our finding that prevalence of arthritis was lower among Asian adults is in accordance with another study showing that Asian adults (including Chinese, South Asian, West Asian, and East Asian adults) in Canada had lower rates of arthritis than White adults (20). Among New Zealanders, the lowest prevalence was also among Asian adults (18).

Arthritis is one of the most common chronic health conditions in Canada. It is a major cause of morbidity, disability, and health care utilization (30). Prevalence of arthritis is highest among adults who are unable to work, but it is also elevated among women and among First Nations and Métis people. Moreover, there is a

BOX 1

FOCUS ON FIRST NATIONS PEOPLE LIVING ON RESERVE AND IN NORTHERN COMMUNITIES–CONTEXTUALIZING RESULTS FROM THE FIRST NATIONS REGIONAL HEALTH SURVEY

Prepared by the First Nations Information Governance Centre

National-level rates of arthritis among First Nations people appear high, but likely vary across communities, and are caused by multiple and inter-related factors. Many of these factors stem from colonization. For example, the Indian Residential School system resulted in generations of First Nations children being forcibly removed from their families and raised in underfunded schools with inadequate facilities and poorly trained staff (21). Abuse, including food deprivation, malnutrition, and hunger, were rampant (22). The effects of these traumas on children's development spanned across generations and continue to predispose many present-day First Nations people to negative health outcomes, including arthritis. This can occur either directly, through immune system deficiencies, or indirectly, through metabolic changes that increase susceptibility for obesity, a risk factor for arthritis (23-26).

Other possible colonial contributors to the high incidences of arthritis include the establishment of reserves as a result of the *Indian Act*. First Nations people were no longer readily able to travel for trade, follow animal migration patterns for hunting, or gather/harvest various plant species (26), disconnecting them from the land and their traditional lifestyles. Limitations in mobility increased once people became isolated on reserve communities and their environments were degraded as a result of industrialization and mass resource extraction (e.g. mining and foresting industries) (26). Combined, these factors diminished the ability of First Nations people to utilize protective factors against arthritis, including being physically active and consuming quality foods that would help regulate weight, promote muscle strength, and enhance immune system functioning (22,25).

The remote setting of many communities also adds an additional barrier to food security and accessible health care services that could assist in the treatment and early detection of arthritis (26,27).

socioeconomic gradient for this condition, where increasing levels of education and income correspond to a decreasing prevalence of those reporting being diagnosed with arthritis.

The disproportionate prevalence of arthritis in certain groups is driven by a complex system of biological, social, and structural drivers of health that remain to be fully explored and understood. A broader knowledge of these drivers, including exposure to risk factors and risk conditions, diagnosis-seeking behaviours, over- and under-reporting, and differences in biology (10), will help to focus policies to reduce inequalities in arthritis outcomes. Research and action on the upstream drivers of arthritis inequalities will also contribute to improving arthritis prevalence and outcomes, as well as reducing inequalities. The ongoing monitoring of arthritis, its determinants, and related inequalities across sociodemographic and socioeconomic groups will support interventions, provide evidence for programs, policy, and research and reveal any changes in the data over time.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Arthritis. Data Source: CCHS 2010–2013

		SUMMARY MEASURES												POPULATION IMPACT MEASURES								
Social Stratifiers		Age-Standardized Prevalence (%)			Prevalence Ratio (PR)			Prevalence Difference (PD) per 100			Attributable Fraction (AF%)			Population Attributable Fraction (PAF%)			Population Attributable Rate (PAR) per 100			Population Impact Number (PIN)		
		Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males
Overall	Both Sexes	16.9	20.0	13.5	NA									NA								
Population Groups																						
Sex/gender	Female	20.0	NA		NA	1.5 *	NA	NA	6.5 *	NA	NA	32.6 *	NA	NA	19.7 *	NA	NA	3.3 *	NA	NA	893,170 *	NA
	Male (reference)	13.5			Reference																	
Indigenous identity	First Nations, off reserve	26.0	30.5	20.9	1.6 *	1.5 *	1.6 *	9.4 *	10.8 *	7.6 *	36.1 *	35.4 *	36.5 *	0.9 *	0.9 *	0.8 *	0.1 *	0.2 *	0.1 *	39,310 *	23,700 *	15,110 *
	Metis	25.8	28.3	23.1	1.5 *	1.4 *	1.7 *	9.2 *	8.6 *	9.9 *	35.7 *	30.5 *	42.7 *	0.8 *	0.6 *	1.0 *	0.1 *	0.1 *	0.1 *	34,430 *	16,840 *	17,610 *
	Inuit	21.1	25.8	18.2 E	1.3	1.3	1.4 E	4.4	6.2	4.9 E	21.0 *	23.9	27.0 E	0.0	0.0	0.0 E	0.0	0.0	0.0 E	1,260	780	770 E
	Non-Indigneous (reference)	16.6	19.7	13.3	Reference																	
Cultural/racial background	Black	14.7	18.8	9.6	0.8 *	0.9	0.7 *	−2.6 *	−1.7	−4.3 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	East/Southeast Asian	10.7	12.1	8.6	0.6 *	0.6 *	0.6 *	−6.6 *	−8.3 *	−5.2 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	South Asian	12.4	16.3	8.8	0.7 *	0.8 *	0.6 *	−4.9 *	−4.1 *	−5.1 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Arab/West Asian	16.6	18.5	14.8	1.0	0.9	1.1	−0.7	−2.0	0.9	NA	NA	6.2	NA	NA	0.1	NA	NA	0.0	NA	NA	2,130
	Latin American	18.1	23.9	11.4 E	1.0	1.2	0.8 E	0.8	3.4	−2.5 E	4.5	14.4	NA	0.1	0.2	NA	0.0	0.0	NA	2,870	5,720	NA
	Other/Multiple origins	14.8	19.0	10.8	0.9	0.9	0.8 *	−2.5	−1.5	−3.1 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	White (reference)	17.3	20.4	13.9	Reference																	
Sexual orientation (aged 18–59)	Bisexual	13.3	13.8	11.8 E	1.4 *	1.3	1.6 * E	4.1 *	3.0	4.3 * E	30.7 *	21.4	36.4 * E	0.5 *	0.4	0.3 * E	0.0 *	0.0	0.0 E	8,440 *	4,330	2,590 * E
	Lesbian/Gay	10.2	16.5	6.5	1.1	1.5 *	0.9	1.0	5.6 *	−1.1	9.9	34.0 *	NA	0.1	0.5 *	NA	0.0	0.1 *	NA	2,710	5,680 *	NA
	Heterosexual (reference)	9.2	10.9	7.5	Reference																	
Immigrant status	Recent	10.3	13.3	7.4 E	0.6 *	0.6 *	0.5 * E	−7.5 *	−7.5 *	−7.1 * E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Long-term	15.1	18.6	11.2	0.8 *	0.9 *	0.8 *	−2.7 *	−2.2 *	−3.3 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Non-immigrant (reference)	17.8	20.8	14.5	Reference																	
Rural/urban residence	Remote areas	20.4	23.2	17.4	1.1 *	1.1 *	1.2 *	2.6 *	2.1 *	3.4 *	12.8 *	8.9 *	19.6 *	0.9 *	0.6 *	1.6 *	0.2 *	0.1 *	0.2 *	42,470 *	16,650 *	27,940 *
	Provincial rural areas	17.9	20.6	15.2	1.0	1.0	1.1 *	0.2	−0.5	1.2 *	0.9	NA	7.8 *	0.1	NA	1.0 *	0.0	NA	0.1 *	4,430	NA	16,960 *
	Small urban centres	19.1	22.6	15.4	1.1 *	1.1 *	1.1 *	1.4 *	1.5 *	1.4 *	7.1 *	6.4 *	8.8 *	1.0 *	0.9 *	1.3 *	0.2 *	0.2 *	0.2 *	45,810 *	24,950 *	22,370 *
	Toronto, Montréal, and Vancouver	14.3	17.2	10.9	0.8 *	0.8 *	0.8 *	−3.5 *	−3.9 *	−3.1 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Large urban centres other than Toronto, Montreal and Vancouver (reference)	17.8	21.1	14.0	Reference																	
Socioeconomic Determinants of Health																						
Income quintile – provincial	Q1 (lowest income)	21.2	24.4	16.5	1.5 *	1.4 *	1.4 *	7.0 *	7.0 *	4.6 *	33.1 *	28.7 *	27.8 *	7.8 *	7.5 *	5.5 *	1.3 *	1.5 *	0.7 *	356,430 *	206,730 *	97,910 *
	Q2	17.8	20.5	14.5	1.3 *	1.2 *	1.2 *	3.7 *	3.1 *	2.6 *	20.5 *	15.3 *	17.9 *	4.1 *	3.1 *	3.4 *	0.7 *	0.6 *	0.5 *	186,520 *	85,990 *	61,520 *
	Q3	16.5	19.9	13.0	1.2 *	1.1 *	1.1 *	2.3 *	2.5 *	1.1 *	13.9 *	12.5 *	8.2 *	2.6 *	2.3 *	1.5 *	0.4 *	0.5 *	0.2 *	116,850 *	63,590 *	27,150 *
	Q4	15.3	17.8	13.0	1.1 *	1.0	1.1 *	1.1 *	0.4	1.1 *	7.4 *	2.4	8.5 *	1.3 *	0.4	1.7 *	0.2 *	0.1	0.2 *	58,800 *	10,820	29,810 *
	Q5 (highest income) (reference)	14.2	17.4	11.9	Reference																	
Education (aged 20+)	Less than high school	21.6	25.4	17.8	1.7 *	1.5 *	1.7 *	8.5 *	8.8 *	7.6 *	39.5 *	34.8 *	42.6 *	6.5 *	5.6 *	7.2 *	1.1 *	1.2 *	1.0 *	293,200 *	153,390 *	128,500 *
	High school graduate	18.0	21.6	13.4	1.4 *	1.3 *	1.3 *	5.0 *	5.1 *	3.2 *	27.5 *	23.5 *	23.7 *	4.9 *	4.3 *	3.9 *	0.9 *	0.9 *	0.5 *	223,540 *	118,650 *	68,740 *
	Some post-secondary	18.8	22.2	15.2	1.4 *	1.3 *	1.5 *	5.7 *	5.7 *	5.0 *	30.4 *	25.6 *	33.0 *	1.9 *	1.5 *	2.2 *	0.3 *	0.3 *	0.3 *	86,800 *	42,520 *	38,810 *
	Community college/Technical school/University certificate	18.1	21.0	14.9	1.4 *	1.3 *	1.5 *	5.0 *	4.5 *	4.7 *	27.6 *	21.3 *	31.6 *	10.5 *	7.8 *	12.5 *	1.8 *	1.6 *	1.7 *	475,630 *	214,920 *	222,020 *
	University graduate (reference)	13.1	16.5	10.2	Reference																	
Employment status (aged 18–75)	Permanently unable to work	33.9	37.7	29.9	2.8 *	2.5 *	3.0 *	21.6 *	22.5 *	20.0 *	63.9 *	59.5 *	66.8 *	4.5 *	3.9 *	4.9 *	0.6 *	0.7 *	0.6 *	156,350 *	84,170 *	71,510 *
	No job last week, looked for work in the past 4 weeks	15.2	17.0	14.2	1.2 *	1.1	1.4 *	3.0 *	1.7	4.3 *	19.6 *	10.1	30.3 *	0.9 *	0.4	1.8 *	0.1 *	0.1	0.2 *	33,420 *	8,740	26,110 *
	No job last week, did not look for work in the past 4 weeks	16.8	18.2	15.0	1.4 *	1.2 *	1.5 *	4.5 *	2.9 *	5.1 *	26.9 *	16.1 *	34.0 *	7.1 *	4.7 *	7.6 *	1.0 *	0.8 *	0.9 *	252,170 *	101,280 *	109,340 *
	Had a job last week (reference)	12.2	15.3	9.9	Reference																	
Occupation (aged 18–75)	Unskilled	15.1	18.5	11.8	1.4 *	1.4 *	1.5 *	4.6 *	5.7 *	4.0 *	30.5 *	30.6 *	34.1 *	2.6 *	2.7 *	2.8 *	0.4 *	0.4 *	0.3 *	80,840 *	49,190 *	35,550 *
	Semiskilled	13.4	16.1	10.6	1.3 *	1.3 *	1.4 *	2.9 *	3.2 *	2.8 *	21.6 *	20.1 *	26.4 *	4.4 *	4.3 *	4.8 *	0.6 *	0.7 *	0.5 *	133,780 *	79,510 *	60,330 *
	Skilled technical supervisor	12.4	15.8	10.5	1.2 *	1.2 *	1.4 *	1.9 *	2.9 *	2.8 *	15.2 *	18.3 *	26.2 *	3.7 *	3.5 *	8.3 *	0.5 *	0.6 *	0.9 *	112,770 *	64,490 *	103,770 *
	Manager	10.3	13.6	8.5	1.0	1.1	1.1	−0.2	0.7	0.8	NA	5.0	9.1	NA	0.3	0.7	NA	0.0	0.1	NA	4,820	8,720
	Professional (reference)	10.5	12.9	7.8	Reference																	

NOTE:

The purpose of the colour scaling is to map, for all indicators and stratifiers, 1- the relative and absolute inequalities; 2- the patterns of inequalities (e.g. Indigenous populations frequently experience inequalities compared to non-Indigenous); 3- the gradients of inequalities (e.g. there are frequently inequalities in a gradient across income strata). The magnitude and distribution of inequalities shown in the table should be interpreted with caution, taking into consideration one indicator at a time, the differences among the data sources used (e.g. survey vs. administrative registry), and existing limitations in the measurement of the social stratifiers.

Colour scaling for rate ratios below 1 and rate differences below 0 was applied using the reciprocal value and the absolute value respectively. For example, for a RR of 0.5, the colour scale applied is for the value 2.0 (1/0.5) and for a RD of -10, the colour scale for the value 10 is used. Colour scaling is only applied when the difference between the value and the reference group is statistically significant.

LEGEND

Not applicable	NA
Non-reportable	F
Report with Caution	E
Statistically Significant	*
Reference	▨

PR	PD per 100	
≥ 2.2	≥ 11.2	Larger inequality
1.7 → 2.2	10.5 → 11.2	↕
1.5 → 1.7	7.9 → 10.5	
1.4 → 1.5	5.9 → 7.9	
1.3 → 1.4	4.4 → 5.8	
1.0 → 1.3	0.0 → 4.4	Smaller inequality

References

(1) Public Health Agency of Canada. Life with arthritis in Canada: a personal and public health challenge [Internet]. Ottawa: Public Health Agency of Canada; 2010 [cited 2017 Feb 20]. Available from: http://www.phac-aspc.gc.ca/cd-mc/arthritis-arthrite/lwaic-vaaac-10/pdf/arthritis-2010-eng.pdf.

(2) Arthritis Community Research & Evaluation Unit. A profile of arthritis in Canada [Internet]. Toronto: Arthritis Society; 2015 [cited 2017 Feb 20]. Available from: http://arthritis.ca/getmedia/870886f4-602c-4589-a584-0d582d962706/arthritis-in-Canada-2013.pdf.

(3) Kelly C, Hamilton J. What kills patients with rheumatoid arthritis? Rheumatology. 2007 Sept;46(2):183-4.

(4) Public Health Agency of Canada. [Internet]. Ottawa: Public Health Agency of Canada; 2014. Economic Burden of Illness in Canada [updated 2014 Jun 20; cited 2017 Feb 20]; [about 2 screens]. Available from: http://www.phac-aspc.gc.ca/ebic-femc/index-eng.php.

(5) Arthritis Society. Arthritis in Canada: facts & figures [Internet]. Ottawa: Arthritis Society; 2015 [cited 2017 Feb 20]. Available from: https://arthritis.ca/getmedia/43e83e3e-1a54-4fda-81d5-042ffaf9983f/Arthritis-Facts-Figures-EN.pdf.

(6) Centers for Disease Control and Prevention. [Internet]. Atlanta: Centers for Disease Control and Prevention; 2016 Feb 10. Risk Factors [updated 2016 May 9; cited 2017 Feb 20]; [about 2 screens]. Available from: https://www.cdc.gov/arthritis/basics/risk-factors.htm.

(7) Edwards C, Cooper C. Early environmental factors and rheumatoid arthritis. Clinical & Experimental Immunology. 2006 Oct;143(1):1-5.

(8) Luong MN, Cleveland RJ, Nyrop KA, Callahan LF. Social determinants and osteoarthritis outcomes. Aging health. 2012;8(4):413-37.

(9) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(10) Kriegsman DM, Penninx BW, Van Eijk, Jacques Th M, Boeke AJP, Deeg DJ. Self-reports and general practitioner information on the presence of chronic diseases in community dwelling elderly: a study on the accuracy of patients' self-reports and on determinants of inaccuracy. J Clin Epidemiol. 1996;49(12):1407-17.

(11) Chen J, Wilkins R, Ng E. Health expectancy by immigrant status, 1986 and 1991. Health rep. 1996 Winter;8(3):29-38.

(12) Rotermann M. The impact of considering birthplace in analyses of immigrant health. Health reports. 2011 Dec;22(4):D1.

(13) Australian Institute of Health and Welfare. Australia's health 2014. Australia's health series no. 14. Cat. no. AUS 178.[Internet]. Canberra: Australian Institute of Health and Welfare; 2014 [cited 2017 Feb 20]. Available from: https://www.aihw.gov.au/getmedia/d2946c3e-9b94-413c-898c-aa5219903b8c/16507.pdf.aspx?inline=true.

(14) Centers for Disease Control and Prevention. Summary Health Statistics: national health interview survey: table A-4. Age-adjusted percentages (with standard erors) of selected diseases and conditions among adults aged 18 and over, by selected characteristics: United States, 2014 [Internet]. Atlanta: U.S. Department of Health and Human Services; 2014 [cited 2017 Feb 20]. Available from: http://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2014_SHS_Table_A-4.pdf.

(15) Sharif B, Garner R, Sanmartin C, Flanagan WM, Hennessy D, Marshall DA. Risk of work loss due to illness or disability in patients with osteoarthritis: a population-based cohort study. Rheumatology. 2016;55:861.

(16) Barnabe C, Jones CA, Bernatsky S, Peschken CA, Voaklander D, Homik J, et al. Inflammatory arthritis prevalence and health services use in the First Nations and Non–First Nations populations of Alberta, Canada. Arthritis care & research. 2017;69(4):467-74.

(17) Barnabe C, Joseph L, Belisle P, Labrecque J, Edworthy S, Barr SG, et al. Prevalence of systemic lupus erythematosus and systemic sclerosis in the First Nations population of Alberta, Canada. Arthritis care & research. 2012;64(1):138-43.

(18) New Zealand Ministry of Health. Annual update of key results 2014/15: New Zealand Health Survey [Internet]. Wellington: New Zealand Ministry of Health; 2015 [cited 2017 Feb 20]. Available from: http://www.health.govt.nz/publication/annual-update-key-results-2014-15-new-zealand-health-survey.

(19) Ferucci ED, Schumacher MC, Lanier AP, Murtaugh MA, Edwards S, Helzer LJ, et al. Arthritis prevalence and associations in American Indian and Alaska Native people. Arthritis Care & Research. 2008 July;59(8):1128-36.

(20) Cañizares M, Power JD, Perruccio AV, Badley EM. Association of regional racial/cultural context and socioeconomic status with arthritis in the population: a multilevel analysis. Arthritis Care & Research. 2008 Feb;59(3):399-407.

(21) Boksa P, Joober R, Kirmayer LJ. Mental wellness in Canada's Aboriginal communities: striving toward reconciliation. J Psychiatry Neurosci. 2015 Nov;40(6):363-5.

(22) Mosby I, Galloway T. "Hunger was never absent": How residential school diets shaped current patterns of diabetes among Indigenous peoples in Canada. Can Med Assoc J. 2017;189(32):E1043-5.

(23) Teramoto M, Breukelman F, Gatto FA, Moonie S. Risk and Protective Factors for Arthritis Status and Severity. Online journal of public health informatics. 2013;5(1).

(24) Mosby I, Galloway T. 'The abiding condition was hunger': assessing the long-term biological and health effects of malnutrition and hunger in Canada's residential schools. British Journal of Canadian Studies. 2017;30(2):147-62.

(25) Stein AD, Lumey LH. The relationship between maternal and offspring birth weights after maternal prenatal famine exposure: the Dutch Famine Birth Cohort Study. Human biology. 2000:641-54.

(26) Scher JU, Sczesnak A, Longman RS, Segata N, Ubeda C, Bielski C, et al. Expansion of intestinal Prevotella copri correlates with enhanced susceptibility to arthritis. Elife. 2013 Nov 5;2:e01202.

(27) Ward BW, Joestl SS, Galinsky AM, Dahlhamer JM. Selected Diagnosed Chronic Conditions by Sexual Orientation: A National Study of US Adults, 2013. Prev Chronic Dis. 2015 Nov 5;12:E192.

(28) Fredriksen-Goldsen KI, Kim H, Barkan SE, Muraco A, Hoy-Ellis CP. Health disparities among lesbian, gay, and bisexual older adults: Results from a population-based study. Am J Public Health. 2013;103(10):1802-9.

(29) Bengtsson C, Nordmark B, Klareskog L, Lundberg I, Alfredsson L. Socioeconomic status and the risk of developing rheumatoid arthritis: results from the Swedish EIRA study. Ann Rheum Dis. 2005;64(11):1588.

(30) Public Health Agency of Canada. [Internet]. Life with Arthritis in Canada: A personal and public health challenge [updated 2010 Available from: http://www.phac-aspc.gc.ca/cd-mc/arthritis-arthrite/lwaic-vaaac-10/3-eng.php#t13.

INEQUALITIES IN
ASTHMA IN CANADA

INEQUALITIES HIGHLIGHTS

- The prevalence of asthma among adults who are permanently unemployed is 2.4 times that of employed adults. This corresponds to 10.7 more cases of asthma per 100 adults who are permanently unemployed than among employed people.
- The prevalence of asthma among lesbian women is 1.8 times that of heterosexual women. This means there are 7.4 more cases of asthma per 100 among lesbian women than among heterosexual women.
- The prevalence of asthma among bisexual adults is 1.7 times that of heterosexual adults. This corresponds to 6.0 more cases of asthma per 100 adults among bisexual adults than among heterosexual adults.
- The prevalence of asthma among adults with less than a high school education is 1.6 times the prevalence among university graduates. This means there are 3.6 more cases of asthma per 100 adults among those with less than a high school education than among university graduates.
- The prevalence of asthma among First Nations adults living off reserve and Métis adults is 1.6 times that of non-Indigenous adults. This means there are 5.0 more cases of asthma per 100 among First Nations adults living off reserve and among Métis adults than among non-Indigenous adults.
- The prevalence of asthma among adults in the lowest income group is 1.4 times the prevalence among adults in the highest income group. This corresponds to 2.9 more cases of asthma per 100 among adults in the lowest income group than among adults in the highest income group.
- The prevalence of asthma among recent immigrants is half that among non-immigrants. This corresponds to 4.8 fewer cases of asthma per 100 adults among recent immigrants than among non-immigrants.

ACRONYM	FULL NAME
BMI	Body Mass Index
CCHS	Canadian Community Health Survey
CI	Confidence Interval
PR	Prevalence Ratio
RHS	First Nations Regional Health Survey

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Asthma is a chronic inflammatory respiratory disorder characterized by bronchospasms and reversible airflow obstruction. Symptoms of asthma include coughing, wheezing, shortness of breath, and chest tightness. Asthma attacks can often lead to emergency department visits and hospitalizations, and, in rare cases, death (1). Asthma is a serious public health issue (1) and a complex, multifactorial disease (2). Asthma can adversely affect physical, psychological, and social aspects of the quality of life of affected individuals (3,4). In 2014, 2.4 million Canadians aged 12 years and over reported having asthma (5). Unfortunately, some two-thirds of people who report having asthma do not have optimal control over their condition (4). The direct and indirect costs of asthma in Canada have been estimated at $2.2 billion per year (6).

The causes of asthma are not well understood, but risk factors include a genetic predisposition combined with exposure to airborne allergens such as pet dander, dust mites, moulds, tobacco smoke, chemical irritants in the workplace, and air pollution (1). Obesity is a risk factor, with a stronger association noted in women than in men (7,8). Asthma attacks may be triggered by exposure to allergens as well as by respiratory infections, exercise, stress, certain medications such as Aspirin, and exposure to cold air (1).

Asthma is most common in childhood, and occurs more frequently in boys; in adults, it is more prevalent in women (9). The burden of asthma is unevenly distributed in the population; a large and compelling body of evidence has shown associations between asthma and socioeconomic status (10-13), neighbourhood characteristics (2), housing conditions (14), and social supports (15).

Asthma was selected as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter).

METHODS

Data on asthma prevalence and stratifier variables were collected through the Canadian Community Health Survey (CCHS) for the period from 2010 to 2013. People with asthma were defined as those who reported being diagnosed with the condition by a health professional.

The analysis of asthma prevalence included CCHS respondents 18 years and older. Inequalities in asthma prevalence were assessed by examining differences in prevalence of asthma according to social stratifiers grouped under socioeconomic and sociodemographic stratifiers collected through the CCHS. Sociodemographic stratifiers include sex/gender, Indigenous identity (First Nations, Inuit, or Métis), cultural/racial background, immigrant status, sexual orientation (ages 18–59 years),[26] and rural/urban residence. Socioeconomic stratifiers include income, education (ages 20+ years), occupation (ages 18–75 years), and employment status (ages 18–75 years). Prevalence data were age-standardized using the 2011 Canadian Census of Population.

For the Indigenous identity stratifier, the CCHS sampling frame captures information on Indigenous people who identify as Inuit, Métis, or First Nations living off reserve, but excludes First Nations people living on reserve and Inuit in the Quebec region of Nunavik. For First Nations people living on reserve and in northern communities, information on asthma is collected by the First Nations Information Governance Centre and its regional partners through the First

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26. The CCHS does not collect data on sexual orientation from individuals over the age of 59 years.

Nations Regional Health Survey (RHS). This chapter uses RHS data from 2008 to 2010, for respondents aged 18 years and older, age-standardized using the 2011 Census of Population. Although the wording in the RHS for the asthma diagnosis question differs slightly from that in the CCHS, the indicator is deemed comparable. (For more detailed information, see the Methodology chapter.)

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported along with the corresponding 95% confidence intervals (CIs). Statistical significance was assessed using 95% confidence intervals (16). Sex/gender-specific inequalities for all of the social stratifiers were also calculated, but reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable fraction, population attributable rate, and population impact number. However, due to methodological limitations in combining two datasets (i.e. CCHS and RHS), results for First Nations people living on reserve and in northern communities were not included in the calculation of inequality measures and are reported here in terms of prevalence only.

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in Canada. (For more detailed information, see the Methodology chapter.)

Findings

An estimated 8.0% (95% CI: 7.8–8.2%) of Canadians 18 years and older reported having been diagnosed with asthma. Most population groups had inequalities in asthma prevalence (Annex 1). (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Sex/Gender

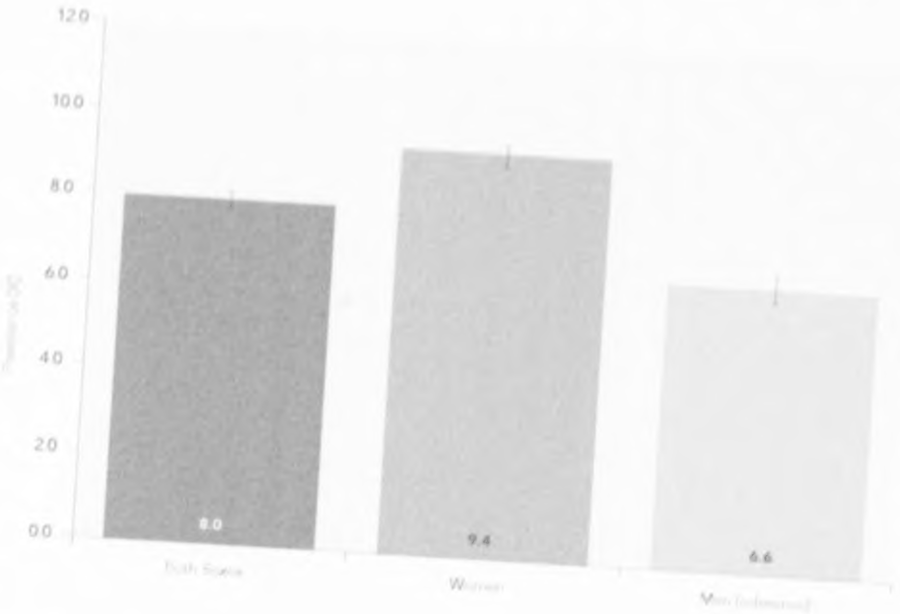
The prevalence of asthma among women was 9.4% (95% CI: 9.1–9.6%) and among men was 6.6% (95% CI: 6.3–6.9%), an absolute difference of 2.8% (95% CI: 2.4–3.1%). If the prevalence of asthma among women was as low as the prevalence among men, there would be 377 960 (95% CI: 324 580–431 340) fewer cases of asthma in Canada. This would result in a 17.5% (95% CI: 15.1–20.0%) reduction in the national prevalence of asthma (Figure 1).

Indigenous Peoples

The prevalence of asthma among First Nations adults living off reserve was 12.8% (95% CI: 11.0–14.7), as was that among Métis adults (12.8%, 95% CI: 11.1–14.6. In comparison, the prevalence was 7.9% (95% CI: (7.7–8.1%) among non-Indigenous adults. In other words, the prevalence of asthma among First Nations adults living off reserve and among Métis adults was, for both populations, 1.6 (95% CI: 1.4–1.9) times the prevalence among non-Indigenous adults (Figure 2).

FIGURE 1

Asthma by Sex/Gender, Canada, ages 18+ years, 2010–2013

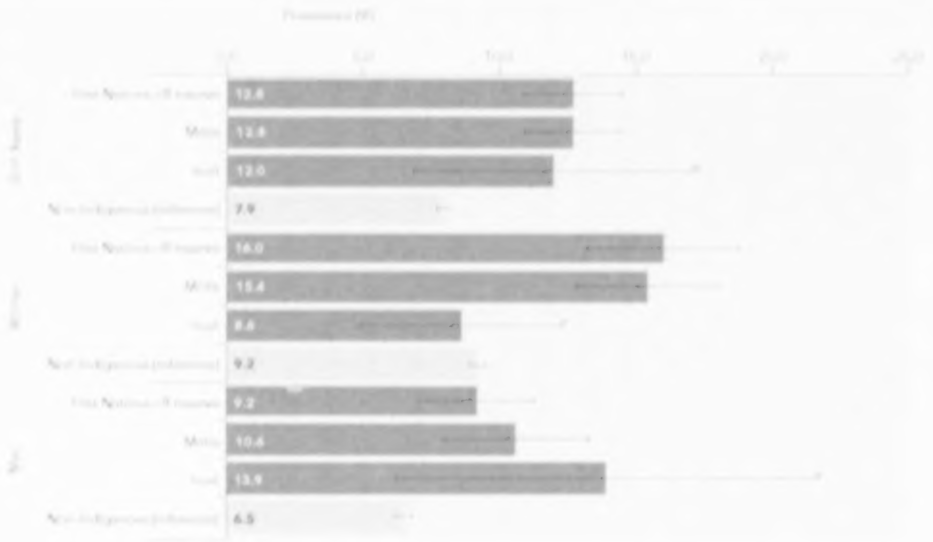


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Women	1.4*	2.8*	29.5*	17.5*	1.4*	377 960*
Men [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

FIGURE 2

Asthma by Indigenous Identity and Sex/Gender, Canada, ages 18+ years, 2010–2013



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
First Nations off reserve	1.6*	5.0*	38.6*	1.0*	0.1*	20 680*
Métis	1.6*	5.0*	38.8*	0.9*	0.1*	18 580*
Inuit	1.5^{E}	4.1^{E}	34.5^{E}	0.1^{E}	0.0^{E}	1 170^{E}
Non-Indigenous (reference)	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
First Nations off reserve	1.7*	6.8*	42.6*	1.2*	0.1*	14 970*
Métis	1.7*	6.2*	40.4*	0.9*	0.1*	12 170*
Inuit	0.9^{E}	-0.6^{E}	NA	NA	NA	NA
Non-Indigenous (reference)	1.0	0.0	0.0	0.0	0.0	0
MEN						
First Nations off reserve	1.4*	2.7*	29.3*	0.6*	0.0*	5 320*
Métis	1.6*	4.1*	39.0*	0.8*	0.1*	7 370*
Inuit	2.1^{E}	7.4^{E}	53.3^{*E}	0.1^{E}	0.0^{E}	1 160^{E}
Non-Indigenous (reference)	1.0	0.0	0.0	0.0	0.0	0

E: Reportable with caution
NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

If prevalence was as low for these two groups as for non-Indigenous adults, the prevalence among First Nations adults living off reserve would be 38.6% (95% CI: 29.5–47.8%) and 38.8% (95% CI: 30.1–47.4%) among Métis adults. The means there would be 20 680 (95% CI: 12 980–28 380) fewer cases of asthma among First Nations adults living off reserve and 18 580 (95% CI: 11 810–25 350) fewer cases among Métis adults in Canada (Figure 2).

Among Inuit adults, the prevalence was 12.0% (95% CI: 6.9–17.1), although these results should be interpreted with caution due to high sampling variability.

In 2008–2010, the prevalence of asthma among First Nations adults living on reserve and in northern communities was 10.1% (95% CI: 9.3–10.9%).[27] Asthma prevalence was almost twice as high among women, at 13.5% (95% CI: 12.2–14.7%), as among men, at 6.8% (95% CI: 6.0–7.7%).

Cultural/Racial Background

Asthma was more prevalent among White adults than in other cultural/racial groups in Canada. The lowest prevalence of asthma was found among East/Southeast Asian adults, at 4.2% (95% CI: 3.5–5.0%), followed by South Asian adults, at 6.1% (95% CI: 4.9–7.3%), and Black adults, at 6.3% (95% CI: 4.6–7.9%). The prevalence of asthma among East/Southeast Asian adults, South Asian adults, and Black adults was, respectively, 0.5 (95% CI: 0.4–0.6), 0.7 (95% CI: 0.6–0.9), and 0.7 (95% CI: 0.5–0.9) times that of White adults (Annex 1).

Sexual Orientation (ages 18–59 years)

The prevalence of asthma among Canadian adults who identified as bisexual was 14.1% (95% CI: 11.2–16.9%), which was 1.7 (95% CI: 1.4–2.1) times that of adults who identified as heterosexual (Figure 3). The prevalence among adults identifying as lesbian or gay was 11.1% (95% CI: 8.6–13.5%), which was 1.4 (95% CI: 1.1–1.7) times that of heterosexual adults (Figure 3).

If the prevalence of asthma among bisexual adults was as low as that among heterosexual adults, this prevalence would be reduced by 42.4% (95% CI: 29.8–54.9%) among bisexual adults. As a result, there would be 12 300 (95% CI: 6 330–18 270) fewer cases of asthma in Canada (Figure 3).

The prevalence of asthma among women who identified as lesbian was 16.7% (95% CI: 12.1–21.4%), which was 1.8 (95% CI: 1.3–2.3) times the prevalence of asthma among heterosexual women. There was no statistically significant difference in the prevalence of asthma for gay men compared with heterosexual men.

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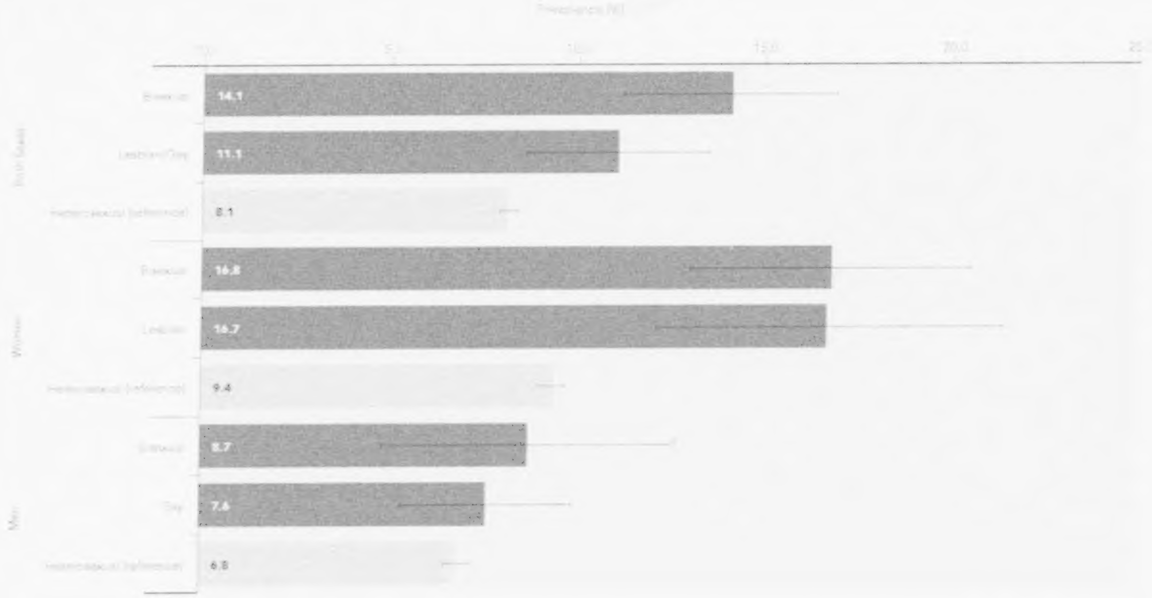
[27] RHS prevalence data are presented alongside CCHS data to approximate the magnitude of inequality between First Nations people living on reserve and in northern communities and the non-Indigenous population. Due to methodological limitations, inequality measures were not calculated for the RHS dataset.

FIGURE 3

Asthma by Sexual Orientation and Sex/Gender, Canada, ages 18–59 years, 2010–2013



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Bisexual	1.7*	6.0*	42.4*	0.7*	0.1*	12 300*
Lesbian/Gay	1.4*	2.9*	26.7*	0.5*	0.0*	7 870*
Heterosexual [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Bisexual	1.8*	7.4*	44.2*	1.1*	0.1*	10 840*
Lesbian	1.8*	7.4*	44.1*	0.8*	0.1*	7 490*
Heterosexual [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Bisexual	1.3^{E}	1.8^{E}	21.0^{E}	0.2^{E}	0.0^{E}	1 090^{E}
Gay	1.1	0.8^{E}	10.2^{E}	0.2^{E}	0.0^{E}	1 280^{E}
Heterosexual [reference]	1.0	0.0	0.0	0.0	0.0	0

E: Reportable with caution
*: Significantly different from reference population
Age standardization was performed using the 2011 Census of Population
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

Immigrant Status

The prevalence of asthma among recent immigrant adults (≤10 years in Canada) was 4.3% (95% CI: 2.9–5.7%), which was 0.5 (95% CI: 0.3–0.6) times that of non-immigrants adults. Among long-term immigrants (>10 years in Canada), the prevalence of asthma was 5.3% (95% CI: 4.7–5.8%). This was 0.6 (95% CI: 0.5–0.6) times that of non-immigrant adults (Figure 4).

Income

The relationship between prevalence of asthma and income was inverse: as income increased, prevalence decreased. Among adults in the lowest income quintile, prevalence was 9.9% (95% CI: 9.3–10.4%), which was 1.4 (95% CI: 1.3–1.5) times the prevalence among adults in the highest income quintile (Figure 5).

If asthma prevalence among adults in the lowest income quintile was the same as that among adults in the highest income quintile, there would be a 29.3% (95% CI: 23.9–34.7%) reduction in this prevalence among adults in the lowest income quintile. This would result in a 6.8% (95% CI: 5.3–8.3%) reduction in the overall proportion of adults with asthma and 146 790 (95% CI: 114 140–179 440) fewer cases of asthma.

If the prevalence of asthma among people living at the lowest income was as low as that among people at high income, there would be a 29.3% reduction in asthma prevalence among people in the lowest income quintile. This would result in 146 790 fewer cases of asthma in Canada.

The magnitude of inequalities in asthma prevalence based on income was similar for both men and women (Figure 5).

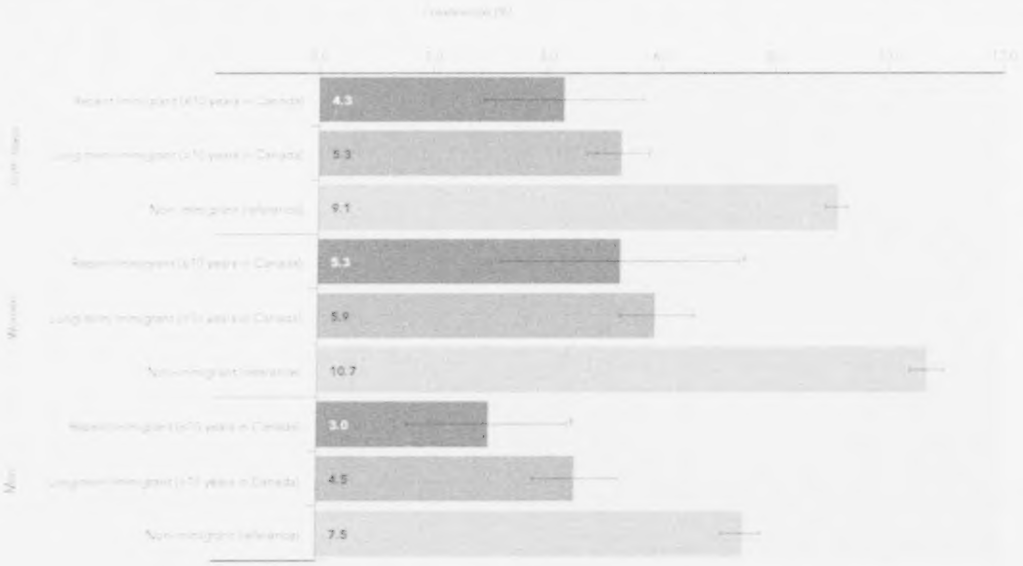
Education (ages 20+ years)

Lower levels of education were generally associated with higher asthma prevalence. For example, the prevalence among adults with less than a high school education was 10.3% (95% CI: 9.6–11.0%). This was 1.6 (95% CI: 1.4–1.7) times the prevalence among university graduates (6.6%, 95% CI: 6.2–7.0%). Compared with men and woman from across the range of education levels, the prevalence of asthma was the highest, at 13.5%, among women with less than a high school education (Figure 6).

If the prevalence among adults with less than a high school education was as low as that of university graduates, there would be a 35.5% (95% CI: 29.6–41.4%) reduction in asthma prevalence among adults with less than a high school education and a 6.0% (95% CI: 4.7–7.4%) reduction nationally. This would represent 125 350 (95% CI: 97 670–153 030) fewer cases of asthma in Canada.

FIGURE 4

Asthma by Immigrant Status and Sex/Gender, Canada, ages 18+ years, 2010–2013

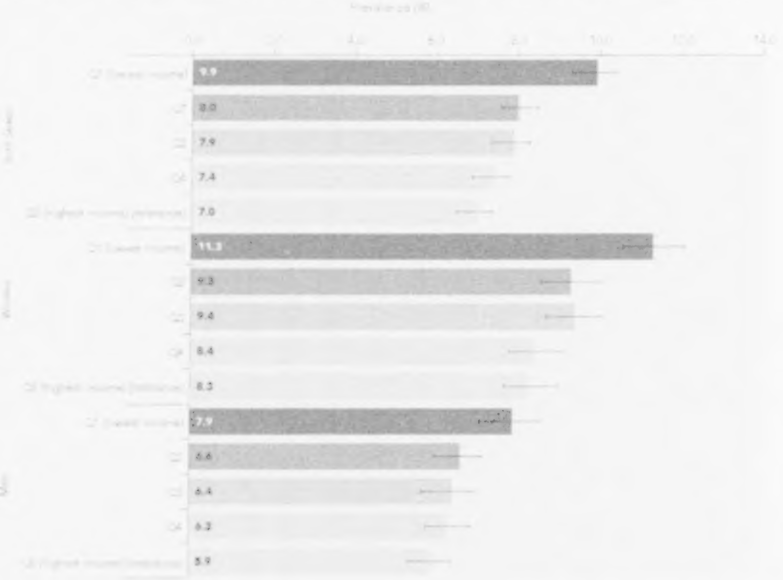


BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Recent Immigrant (≤10 years in Canada)	0.5*	−4.8*	NA	NA	NA	NA
Long-term Immigrant (>10 years in Canada)	0.6*	−3.8*	NA	NA	NA	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Recent Immigrant (≤10 years in Canada)	0.5*E	−5.4*E	NA	NA	NA	NA
Long-term Immigrant (>10 years in Canada)	0.6*	-4.8*	NA	NA	NA	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Recent Immigrant (≤10 years in Canada)	0.4*E	−4.5*E	NA	NA	NA	NA
Long-term Immigrant (>10 years in Canada)	0.6*	−2.9*	NA	NA	NA	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0

E: Reportable with caution
NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

FIGURE 5

Asthma by Income Quintile and Sex/Gender, Canada, ages 18+ years, 2010–2013

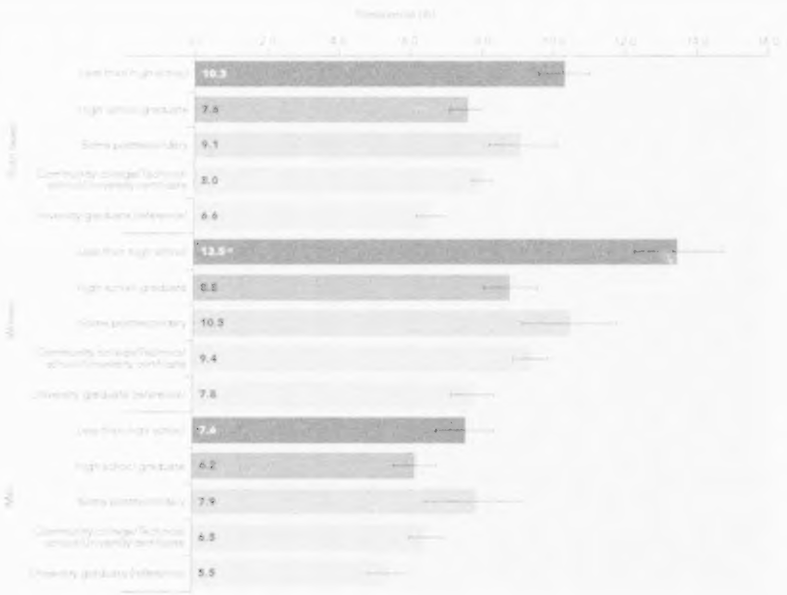


BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Q1 (lowest income)	1.4*	2.9*	29.3*	6.8*	0.5*	146 790*
Q2	1.2*	1.1*	13.4*	2.6*	0.2*	54 880*
Q3	1.1*	0.9*	11.6*	2.2*	0.2*	46 580*
Q4	1.1	0.4	5.3	0.9	0.1	20 330
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Q1 (lowest income)	1.4*	3.0*	26.3*	6.8*	0.6*	87 830*
Q2	1.1	1.0	10.6	2.1	0.2	27 160
Q3	1.1*	1.0*	11.0*	2.0*	0.2*	26 190*
Q4	1.0	0.1	0.9	0.1	0.0	1 890
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Q1 (lowest income)	1.3*	2.0*	25.1*	4.9*	0.3*	42 250*
Q2	1.1	0.7	10.5	1.9	0.1	16 350
Q3	1.1	0.5	7.7	1.4	0.1	12 470
Q4	1.1	0.5	7.2	1.4	0.1	12 410
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

FIGURE 6

Asthma by Education Level and Sex/Gender, Canada, ages 20+ years, 2010–2013



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Less than high school	1.6*	3.6*	35.5*	6.0*	0.5*	125 350*
High school graduate	1.1*	1.0*	12.6*	2.1*	0.2*	43 050*
Some postsecondary	1.4*	2.5*	27.4*	1.8*	0.1*	38 030*
Community college/Technical school/University certificate	1.2*	1.4*	17.2*	6.3*	0.5*	130 760*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Less than high school	1.7*	5.7*	42.4*	7.9*	0.8*	99 660*
High school graduate	1.1*	1.0*	11.7*	1.9*	0.2*	24 090*
Some postsecondary	1.4*	2.7*	26.1*	1.6*	0.2*	20 580*
Community college/Technical school/University certificate	1.2*	1.6*	17.2*	6.2*	0.6*	77 790*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Less than high school	1.4*	2.2*	28.4*	4.4*	0.3*	36 960*
High school graduate	1.1	0.8	12.2	2	0.1	16,530
Some postsecondary	1.4*	2.4*	30.5*	2.2*	0.1*	18 500*
Community college/Technical school/University certificate	1.2*	1.1*	16.6*	6.1*	0.4*	51 060*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

Employment Status and Occupation

The prevalence of asthma was higher among unemployed adults than among employed adults. Among unemployed adults looking for work, the prevalence was 9.1% (95% CI: 8.0–10.2%); among unemployed adults not looking for work, it was 8.8% (95% CI: 8.2–9.4%); and among employed adults, it was lower, at 7.4% (95% CI: 7.2–7.7%) (Figure 7).

Adults who were permanently unable to work had the highest prevalence of asthma, at 18.1% (95% CI: 16.0–20.2%). This was 2.4 (95% CI: 2.1–2.7) times the prevalence among employed adults. This corresponds to 10.7 (95% CI: 8.6–12.8) more asthma cases per 100 among adults who were permanently unable to work (Figure 7).

If the prevalence of asthma among adults permanently unable to work was the same as that among employed adults, there would be a 59% (95% CI: 53.9–64.1%) reduction in the prevalence of asthma among those permanently unable to work. The overall reduction in Canada would be 3.8% (95% CI: 3.1–4.6%). This represents 78 490 (95% CI: 62 360–94 630) fewer cases of asthma.

In a comparison of people who were permanently unable to work and those who were currently unemployed, the inequality in prevalence of asthma was slightly higher among women (prevalence ratio [PR] = 2.6) than among men (PR = 2.1). Women who were permanently unable to work reported the highest asthma prevalence (22.4%).

There were no statistically significant differences in the prevalence of asthma by occupational group (Annex 1).

Rural/Urban Residence

Among adults living in Toronto, Montréal, and Vancouver,[28] the prevalence of asthma was 7.0% (95% CI: 6.6–7.4%). This was 0.8 (95% CI: 0.8–0.9) times that of adults living in other large urban centres. There were no statistically significant differences in the prevalence of asthma among adults living in rural or remote areas compared with those living in other large urban centres (Annex 1).

DATA GAPS/LIMITATIONS

Although the validity of questionnaires that rely on self-reports of health professional–diagnosed conditions has been shown to be acceptable, the prevalence of asthma may be underestimated because of underdiagnosed cases (17). For example, in a study linking CCHS participants to health administrative data, the health administrative data showed higher asthma prevalence (9.6%) than the self-reported data (7.8%) (18). In another Canadian study, however, about one-third of physician-diagnosed cases of asthma did not have asthma when objectively assessed (19). This finding suggests the potential for both over- and under-diagnosis.

The prevalence of asthma in a given population may also reflect the awareness of asthma in that population (20). How these various factors relate to the different inequalities that were observed is unknown. Moreover, data collected for asthma and other chronic conditions was based on respondents being diagnosed by a health professional, which is often harder to get in remote communities. This may result in a possible underestimation of asthma prevalence, as well as the size of inequalities reported for some population groups, by Indigenous identity or rural/urban residence.

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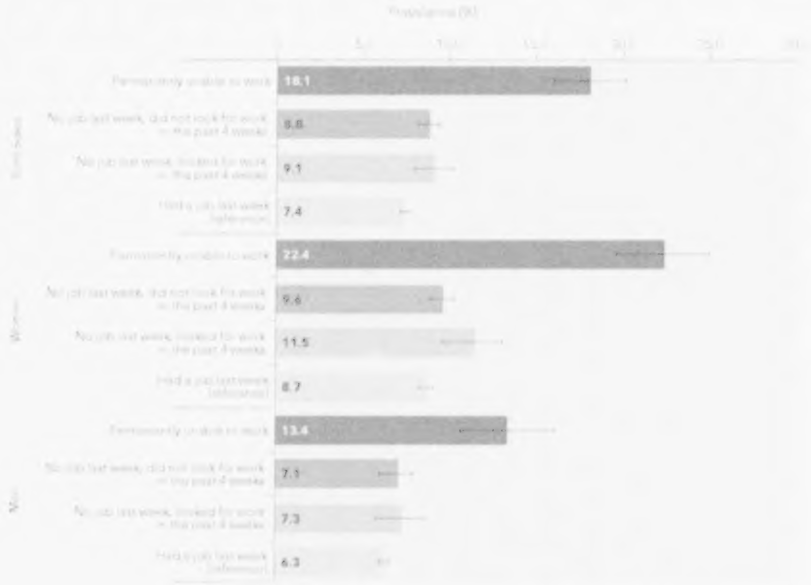
[28] For definitions of rural/urban subgroups, see the Methodology chapter.

FIGURE 7

Asthma by Employment Status and Sex/Gender, Canada, ages 18–75 years, 2010–2013



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Permanently unable to work	2.4*	10.7*	59.0*	3.8*	0.3*	78 490*
No job last week, did not look for work in the past 4 weeks	1.2*	1.3*	15.3*	3.7*	0.3*	74 950*
No job last week, looked for work in the past 4 weeks	1.2*	1.7*	18.2*	0.9*	0.1*	18 550*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Permanently unable to work	2.6*	13.7*	61.0*	4.3*	0.4*	51 470*
No job last week, did not look for work in the past 4 weeks	1.1*	0.9*	9.2*	2.5*	0.2*	30 570
No job last week, looked for work in the past 4 weeks	1.3*	2.8*	24.0*	1.2*	0.1*	14 160*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Permanently unable to work	2.1*	7.1*	53.0*	3.0*	0.2*	25 510*
No job last week, did not look for work in the past 4 weeks	1.1	0.8	10.9	2.0	0.1	16 460
No job last week, looked for work in the past 4 weeks	1.2	1.0	13.7	0.7	0.0	6 090
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

Because the data presented are cross-sectional, it is not possible to infer causality. For example, asthma prevalence was higher among CCHS respondents who were unable to work. While this may be because those who were unable to work were at an increased risk of developing asthma, it may also be that asthma interfered with their ability to work or seek work.

Although statistical significance of observed health differences can be assumed using comparisons of 95% confidence intervals (16), calculating *p*-values would more rigorously confirm the existence of statistically significant differences.

The current analysis was meant to capture the depth and impact of inequalities in the prevalence of asthma on different socially stratified groups at a given point in time. The disproportionate burden of asthma of these groups is driven by a complex system of social and structural drivers of health, which have yet to be fully explored and understood.

These findings do not capture the heterogeneous nature of the stratifier groups. For example, a comparison of the immigrant population as a whole to the non-immigrant population does not capture the nuances of inequality that exist within and between different immigrant populations. This can, therefore, lead to an over- or underestimation of the health burden facing these groups (21). Moreover, the use of a combined cultural and racial background grouping can also lead to an over- or underestimation of prevalence as a result of grouping heterogeneous groups under a single social categorization (22). In addition, the inequalities facing individuals and communities who hold multiple and intersecting social identities were not captured here.

Missing data may result in some inequalities not being reported. In other cases, small numbers mean that data need to be interpreted with caution.

DISCUSSION

Asthma was more prevalent among women than men. Similar findings have been reported for the United States of America (USA) (23,24). Higher risks may relate to differences in biology (e.g. sex hormones), environmental factors (e.g. different exposures to allergens), and behavioural differences between men and women (e.g. health care–seeking behaviours) (23).

For both Canadian men and women, there was an inverse relationship between asthma prevalence and both education and income. This finding differs from that of an Australian study that noted an effect only for men for education and women for income (25).

In the USA, having a high school diploma or equivalent and an income below the national poverty line were associated with an increased risk of reporting an asthma attack in adults (26). Similarly, after adjusting for sex, age, hay fever, smoking, and occupational exposure, Norwegian adults with a lower educational level were found to have a higher risk of developing asthma (27). Lower educational attainment has also been associated with worse asthma control and greater emergency health service use in a Canadian cohort of adults with asthma (28).

Our findings with regard to income are in line with previous studies (29,30) that reported Canadians 12 years or older living in low income areas are at an increased risk of asthma. Similar to our results, these findings were consistent for both men and women.

However, an earlier study (29) found no significant difference between middle- and high-income categories. A number of mechanisms can explain this association. One explanation could be that lower-income groups may be more exposed to indoor allergens (e.g. cockroaches and mice) and outdoor allergens (e.g. urban pollution). Living and working under hazardous conditions (28,30) is another possibility. Having asthma may also interfere with employment, which has an impact on income. In fact, we observed a higher prevalence of asthma among adults who were unemployed than among employed adults.

Higher prevalence of asthma was also observed among lesbian or bisexual women than among heterosexual women. Results from the US Behavioral Risk Factor Surveillance System indicated significantly higher asthma prevalence rates among same-sex partnered men and women than among heterosexual men and women (31). Another study (32) showed that some risk factors of asthma among heterosexual adults, such as obesity and smoking (either current or former), are also associated with asthma in lesbian, gay, and bisexual adults.

The prevalence of asthma in First Nations adults living off reserve and in Métis adults was 1.6 times that of non-Indigenous adults. Similarly, data from the 2006 Aboriginal Peoples Survey and the 2007 CCHS indicated that First Nations adults living off reserve and Métis adults were twice as likely to report an asthma diagnosis (33). This increased risk remained after adjusting for covariates such as income, education, body mass index (BMI), age, sex, and smoking status (33). (For additional context on asthma among First Nations people living on reserve and in northern communities, see Box 1.)

In Australia, the prevalence of asthma among Indigenous people was almost twice as high as among non-Indigenous people. This inequality was even more marked among older adults (34). In the USA, a higher prevalence of asthma was also reported among American Indian and Alaska Native adults compared with the general population (35).

Our findings show that East/Southeast Asian, South Asian, and Black adults in Canada had a lower prevalence of asthma than White adults did. In the USA, however, prevalence was higher among Black adults (10.3%) than among White adults (7.8%) (36), and lowest among Asian and Hispanic adults (37). It is important to note that the methods for collecting race/ethnicity data are not necessarily standard across studies, databases, or reports.

The prevalence of asthma was lower among recent and long-term immigrants than among non-immigrants adults, and higher among long-term immigrants than among recent immigrants. A lower prevalence of asthma was also reported among immigrants in the United States (38). A systematic review of trends in the prevalence of asthma over time since immigration to Australia, Europe, Israel, and the USA indicates that prevalence among immigrants compared with similar age groups of non-immigrants increased with increasing years of residence (39). Several social pathways might be involved: adaptation to a new environment; changes in availability, affordability, and accessibility of health care services, which might make diagnosis more accurate over time; and traumatic experiences and distress during migration (39).

Adults living in Toronto, Montréal, and Vancouver reported an asthma prevalence lower than adults living in other large urban centres. There were no statistically significant differences in the prevalence of asthma among adults living in rural or remote areas compared with those living in other large urban centres. Conversely, a review of studies has shown that asthma is more common among adult urban dwellers than adult rural dwellers in many parts of the world, including in developed countries (40).

While asthma is often thought to be a childhood disease, it affects the physical, psychological, and social aspects of many adult Canadians' quality of life (3,4). The prevalence of asthma is higher among women, adults who are permanently unable to work, gay, lesbian, or bisexual adults, and Indigenous people; it is less common among immigrants and other identified cultural/racial backgrounds. There is also a socioeconomic gradient evident in asthma, with rates increasing as income and education levels decrease. Although there are a number of individual factors that make people more prone to develop asthma, including genetic predisposition and obesity, these are greatly impacted by the socioeconomic and physical environments.

Measuring inequalities in asthma helps to inform and strengthen interventions to reduce the revealed differences and related impacts across society and within affected population groups. Policy interventions that aim to better address these inequalities will need to impact the broader known determinants such as the physical environment (e.g. indoor and outdoor air pollution, neighbourhood characteristics, housing conditions), socioeconomic status, and social supports. The ongoing monitoring of health inequalities across sociodemographic and socioeconomic groups will help identify how these data are changing over time and to inform and support programs, policies, and research.

BOX 1

FOCUS ON FIRST NATIONS PEOPLE LIVING ON RESERVE AND IN NORTHERN COMMUNITIES–CONTEXTUALIZING RESULTS FROM THE FIRST NATIONS REGIONAL HEALTH SURVEY

Prepared by the First Nations Information Governance Centre

First Nations people may have high rates of asthma because of various inter-related factors stemming from the long-term effects of colonization on the present-day lifestyles and environmental conditions of their communities. The creation of government-controlled reserves, urbanization of traditional lands, and forced attendance at Indian Residential Schools disrupted the transmission of culture across generations and thwarted access to sources of economic sustenance. These sources include trade, and harvesting and hunting practices that are dependent on animal migration and the sustainability of animal/plant habitats (33). The displacement and limited mobility of First Nations people not only contributed to elevated overweight/obesity rates (a risk factor for asthma) and diminished well-being, but also created barriers to socioeconomic development (34,35). As a result, many communities have dire housing conditions such as overcrowding, poor indoor ventilation and mould growth. Homes are often older and/or in need of repairs (36). These housing conditions can increase the risk of respiratory infections early in life, a factor that contributes to the development of asthma (34,36). Further, the influence of Westernized uses of commercialized tobacco, coupled with traditional tobacco use, has normalized cigarette smoking in many communities as a means to cope with daily stressors (34,37). As a result, First Nations people are exposed to high rates of cigarette smoke, including during fetal development and in childhood (e.g. through second-hand exposure from cultural gatherings, in households), which also increases the risk for asthma (e.g. through frequent respiratory infections (38,39).

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Asthma. Data Source: CCHS 2010–2013

Social Stratifiers		Age-Standardized Prevalence (%)			Prevalence Ratio (PR)			Prevalence Difference (PD) per 100			Attributable Fraction (AF%)			Population Attributable Fraction (PAF%)			Population Attributable Rate (PAR) per 100			Population Impact Number (PIN)		
					SUMMARY MEASURES									POPULATION IMPACT MEASURES								
		Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males
Population Groups																						
Socioeconomic Determinants of Health																						

NOTE:

LEGEND

References

(1) World Health Organization. [Internet]. Geneva: WHO; 2013 Nov. Asthma fact sheet [updated 2017 Apr; cited 2017 Oct 03]; [about 3 screens]. Available from: http://www.who.int/mediacentre/factsheets/fs307/en/.

(2) Chen E, Schreier H. Does the social environment contribute to asthma? Immunol allergy Clin North Am. 2008 Aug;28(3):649-64.

(3) Global Asthma Network. The global asthma report 2014 [Internet]. Auckland, New Zealand: Global Asthma Network; 2014 Available from: http://www.globalasthmareport.org/resources/Global_Asthma_Report_2014.pdf.

(4) Public Health Agency of Canada. [Internet]. Public Health Agency of Canada; 2015. Fast Facts about Asthma:
Data compiled from the 2011 Survey on Living with Chronic Diseases in Canada [updated 2015 Available from: http://www.phac-aspc.gc.ca/cd-mc/crd-mrc/asthma_fs_asthme-eng.php.

(5) Statistics Canada. [Internet]. Statistics Canada; 2016. Asthma, by sex, provinces and territories [updated 2016 2016 Mar 7; Available from: http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/health50a-eng.htm.

(6) Conference Board of Canada. Cost risk analysis for chronic lung disease in Canada. 2012 Mar.

(7) Greenblatt R, Mansour O, Zhao E, Ross M, Himes BE. Gender-specific determinants of asthma among US adults. Asthma research and practice. 2017 Jan;3(1):2.

(8) Sood A. Sex differences: implications for the obesity-asthma association. Exerc Sport Sci Rev. 2011 Jan;39(1):48-56.

(9) Postma DS. Gender differences in asthma development and progression. Gender Medicine 2007 2007;4:S133-S146.

(10) Ekerljung L, Sundblad B, Rönmark E, Larsson K, Lundbäck B. Incidence and prevalence of adult asthma is associated with low socio economic status. Clin res J. 2010 July;4(3):147-56.

(11) Ellison-Loschmann L, Sunyer J, Plana E, Pearce N, Zock JP, Jarvis D, et al. Socioeconomic status, asthma and chronic bronchitis in a large community-based study. Eur Respir J. 2007 May;29(5):897-905.

(12) Hedlund U, Eriksson K, Rönmark E. Socio-economic status is related to incidence of asthma and respiratory symptoms in adults. Eur Respir J. 2006;28(2):303-410.

(13) Williams D, Sternthal M, Wright R. Social determinants: Taking the social context of asthma seriously. Pediatrics. 2009 Mar;123(3):174.

(14) Oudin A, Richter J, Taj T, Al-nahar L, Jakobsson K. Poor housing conditions in association with child health in a disadvantaged immigrant population: a. BMJ Open. 2016;6(1).

(15) Loerbroks A, Apfelbacher CJ, Bosch JA, Sturmer T. Depressive symptoms, social support, and risk of adult asthma in a population-based cohort study. Psychosom Med. 2010 Apr;72(3):309-15.

(16) du Prel JB, Hommel G, Röhrig B, Blettner M. Confidence interval or p-value?: Part 4 of a series on evaluation of scientific publications. Deutsches Ärzteblatt International. 2009;106(19):335.

(17) Chu LM, Pahwa P. Prevalence and associated factors for self-reported asthma in a Canadian population: The Canadian Community Health Survey, 2014. Journal of Asthma. 2017:1-9.

(18) Muggah E, Graves E, Bennet C, Manuel D. Ascertainment of chronic diseases using population health data: a comparison of health administrative data and patient self-report. BMC Public Health. 2013 Jan;13(16).

(19) Aaron SD, Vandemheen KL, FitzGerald JM, Ainslie M, Gupta S, Lemière C, et al. Reevaluation of diagnosis in adults with physician-diagnosed asthma. JAMA. 2017;317(3):269-79.

(20) Eder W, Ege MJ, von Mutius E. The asthma epidemic. N Engl J Med. 2006 11/23; 2017/03;355(21):2226-35.

(21) Chen J, Ng E, Wilkins R. The health of Canada's immigrants in 1994-95. Health rep. 1996 Spring;7 Cat. no. 82-003(4):33-46.

(22) Edwards C, Fillingim R, Keefe F. Race, ethnicity and pain. Pain. 2001 Nov;94(2):133-7.

(23) Zein JG ES. Asthma is different in women. Curr Allergy Asthma Rep. 2015;15(6):28.

(24) Melgert BN, Ray A, Hylkema MN, Timens W, Postma DS. Are there reasons why adult asthma is more common in females? Curr Allergy Asthma Rep. 2007;7(2):143.

(25) Chittleborough CR, Taylor AW, Dal Grande E, Gill TK, Grant JF, Adams RJ, et al. Gender differences in asthma prevalence: variations with socioeconomic disadvantage. Respirology. 2010 Jan;15(1):107-14.

(26) Moorman JE, Person CJ, Zahran HS. Asthma attacks among persons with current asthma—United States, 2001–2010. MMWR. 2013 Nov;62(3):93-8.

(27) Eagan TM, Gulsvik A, Eide GE, Bakke PS. The effect of educational level on the incidence of asthma and respiratory symptoms. Respiratory Medicine. 2004;98(8):730.

(28) Bacon SL, Bouchard A, Loucks EB, Lavoie KL. Individual-level socioeconomic status is associated with worse asthma morbidity in patients with asthma. Respiratory Research. 2009;10(1):125.

(29) Chen Y, Tang M, Krewski D, Dales R. Relationship between asthma prevalence and income among Canadians. JAMA. 2001;286(8):919-20.

(30) Chen Y, Dales R, Tang M, Krewski D. Association between income adequacy and asthma in Canadians.[Internet]. Ottawa: Statistics Canda; 2002 [cited 2017 Mar 17]. Available from: http://www.statcan.gc.ca/pub/11-522-x/2002001/session1/6713-eng.pdf.

(31) Blosnich JR, Lee JG, Bossarte R, Silenzio VM. Asthma disparities and within-group differences in a national, probability sample of same-sex partnered adults. Am J Public Health. 2013 Sept;103(9):e83-7.

(32) Landers SJ, Mimiaga MJ, Conron KJ. Sexual orientation differences in asthma correlates in a population-based sample of adults. Am J Public Health. 2011;101:2238.

(33) Garner R, Carriere G, Sanmartin C. The health of First Nations living off-reserve, Inuit, and Métis adults in Canada: the impact of socio-economic status on inequalities in health. Health Research Working Paper Series. 2010:86.

(34) Asthma Australia. [Internet]. Fortitude Valley (QLD): Asthma Australia; 2016. What is asthma? Statistics [updated c 2016; cited 2017 Mar 17]; [about 2 screens]. Available from: http://www.asthmaaustralia.org.au/national/about-asthma/what-is-asthma-/statistics.

(35) Orell LJ, Ferucci ED, Lanier AP, Etzel RA. Self-reported asthma among American Indian and Alaska Native people in Alaska. J Health Care Poor Underserved. 2011;22(4):1264-78.

(36) Centers for Disease Control and Prevention. [Internet]. Atlanta: CDC; 2013. Data, statistics, and surveillance: asthma surveillance data. [updated 2016 Sep 08; cited 2017 Mar 06]; [about 2 screens]. Available from: https://www.cdc.gov/asthma/asthmadata.htm.

(37) Gorman BK, Chu M. Racial and ethnic differences in adult asthma prevalence, problems, and medical care. Ethn Health. 2009 Sep;14(5):527-52.

(38) Silverberg J, Durkin H, Joks R. Association between birthplace, prevalence, and age of asthma onset in adults: a United States population-based study. Ann Allergy Asthma Immunol. 2014 Oct;113(4):410-7.

(39) Cabieses B, Uphoff E, Pinart M, Antó J, Wright J. A systematic review on the development of asthma and allergic diseases in relation to international immigration: the leading role of the environment confirmed. PLoS One. 2014 Aug;9(8):e105347.

(40) Jie Y, Isa Z, Jie X, Ismail N. Urban vs. rural factors that affect adult asthma. Rev Environ Contam Toxicol. 2013;226:33-63.

INEQUALITIES IN
DIABETES IN CANADA

INEQUALITIES HIGHLIGHTS

- The prevalence of diabetes among adults permanently unable to work is 2.9 times the prevalence of diabetes among employed adults (i.e. those who had a job in the previous week). This represents 9.6 more cases of diabetes per 100 people among adults permanently unable to work than among employed adults.
- The prevalence of diabetes among South Asian and Black adults is, respectively, 2.3 and 2.1 times the prevalence among White adults. This represents 8.1 and 6.6 more cases of diabetes per 100 people.
- The prevalence of diabetes among adults who have not completed high school is 2.1 times that of adults with a university education. This represents 5.2 more cases of diabetes per 100 people among adults who have not completed high school than among university-educated adults.
- Adults living in the lowest income group have a diabetes prevalence 2 times that of adults in the highest income group. This represents 4.9 more cases of diabetes among adults living in the lowest income than among adults in the highest income per 100 people.
- Inequalities by income, education level, and employment are greater among women than among men. For example, the prevalence of diabetes among women with the lowest level of education is 2.9 times that of women with the highest level of education; among men, this prevalence ratio is 1.7. This difference in prevalence corresponds to 6.5 and 4.5 more cases of diabetes per 100 people among women and men with the lowest level of education, respectively.
- The prevalence of diabetes among First Nations adults living off reserve and Métis adults is, respectively, 1.9 and 1.5 times that of non-Indigenous adults. This corresponds to 5.9 more cases of diabetes per 100 people among First Nations adults living off reserve and 3.1 more cases of diabetes per 100 people among Métis adults than among non-Indigenous adults.

ACRONYM	FULL NAME
BMI	Body Mass Index
CCDSS	Canadian Chronic Disease Surveillance System
CCHS	Canadian Community Health Survey
CI	Confidence Interval
FNIGC	First Nations Information Governance Centre
RHS	First Nations Regional Health Survey

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Diabetes, one of the most common chronic diseases, occurs when the body cannot produce and/or properly use insulin. Close to 2.7 million (7.7%) Canadians were living with diagnosed diabetes (type 1 and 2 combined) in 2011/2012 (1,2). Of the three major types of diabetes—type 1, type 2, and gestational diabetes (occurs in pregnancy)—type 2 diabetes makes up 90–95% of all diabetes cases (3). Complications from this disease include heart disease, stroke, vision loss or blindness, kidney failure, neuropathy, lower limb amputation, erectile dysfunction, and depression (3). A report from 2009 cited that about 3.5% of Canada's public health care spending is from direct costs of diabetes (4).

Risk factors for type 2 diabetes include age, family history, ethnicity, physical inactivity, poor nutrition, smoking, and being overweight or obese (3). Inequities in diabetes risk across Canada are driven by social determinants such as income, education level, employment and working conditions, food security, early childhood development, social support and connectedness, the built environment, and access to prevention and care services (3). These determinants influence opportunities, access to, and choices in healthy eating and physical activity. They also affect diabetes management, disease progression, and mortality risk (5).

Although not all of the risk factors for type 1 diabetes have been identified, it is believed that environmental factors as well as genetic predisposition are necessary to trigger the autoimmune response against insulin-producing cells (3).

The complex interactions between genetic factors, cultural and behavioural factors, and social determinants of health result in inequalities in the burden of diabetes for a number of population groups in Canada, including First Nations, Métis, and people of South Asian and African ancestry (3). The links between diabetes risk and social and economic exclusion are being increasingly recognized as key to understanding and responding to the high prevalence of diabetes in Canada (6).

As a result, diabetes was selected as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter.)

METHODS

Data on diabetes prevalence and stratifier variables were collected through the self-reported Canadian Community Health Survey (CCHS) between 2010 and 2013. The types of diabetes assessed are in adults aged 18 years and over and include type 1 and type 2 diabetes but not gestational diabetes. The CCHS asked: "Other than during pregnancy, has a health professional ever told you that you have diabetes?" Similarly, the First Nations Regional Health Survey (RHS) asked adult respondents if they had ever had diabetes, and then asked which type.

Inequalities in diabetes prevalence were assessed by examining differences in diabetes according to social stratifiers grouped under socioeconomic and sociodemographic stratifiers collected through the CCHS. Sociodemographic stratifiers include sex/gender, Indigenous identity, cultural/racial background, immigrant status, sexual orientation (18–59 years)[29], and rural/urban residence. Socioeconomic stratifiers include income, education (ages 20+ years), occupation, and employment status (18–75 years). The analysis of diabetes prevalence data included people aged 18 years and over; prevalence data were age-standardized using the 2011 Canadian Census of Population.

For the Indigenous identity stratifier, the CCHS sampling frame captures information on Indigenous people who identify as Inuit, Métis, or First Nations living off reserve, but excludes First Nations people living on reserve and Inuit in the Quebec region of Nunavik. For First Nations people living on reserve and in northern communities, comparable information is collected by the First Nations Information Governance Centre (FNIGC) and its regional partners through the First Nations Regional Health Survey (RHS). This chapter uses RHS data from 2008 to 2010, for respondents aged 18 years and older, age-standardized using the 2011 Census of Population.

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported with the corresponding 95% confidence intervals (CIs). Statistical significance was assessed using 95% confidence intervals (7). Sex/gender-specific inequalities for all of the stratifiers were calculated but reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable fraction, population attributable rate, and population impact number. However, due to methodological limitations in combining two datasets (i.e. CCHS and RHS), results for First Nations people living on reserve and in northern communities were not included in the calculation of inequality measures and are reported here in terms of prevalence only.

This report provides a baseline for the ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in the Canadian context. (For more detailed information, see the Methodology chapter.)

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29. The CCHS does not collect data on sexual orientation from individuals over the age of 59.

FINDINGS

Between 2010 and 2013, the prevalence of self-reported diabetes in the Canadian adult population 18 years and older was 6.9% (95% CI: 6.7–7.1%) (Annex 1), which represents 1 852 780 Canadian adults. Inequalities in diabetes prevalence were found between social groups in many populations, but not in relation to rural/urban residence and sexual orientation. The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Sex/Gender

The prevalence of diabetes among men (7.9%; 95% CI: 7.7–8.2%) was 1.3 times that among women (6.0%; 95% CI: 5.7–6.2%). For every 100 Canadian adults, this means there were 1.8 more men with diabetes than women with diabetes (Annex 1).

If men had the same diabetes prevalence as women, there would be 260 270 fewer cases of diabetes in Canada.

Indigenous Peoples

According to the 2008–2010 RHS, the prevalence of type 1 and type 2 diabetes among First Nations adults living on reserve and in northern communities was 19.0% (95% CI: 17.8–20.2%)[30]. In contrast, based on 2010–2013 CCHS data, the prevalence among non-Indigenous adults was 6.8% (95% CI: 6.6–6.9%) (Figure 1).

In 2010–13, the prevalence of type 1 and type 2 diabetes among First Nations adults living off reserve was 12.7% (95% CI: 11.1–14.3%), which was 1.9 (95% CI: 1.6–2.1) times that of non-Indigenous adults. The prevalence among Métis adults was 9.9% (95% CI: 8.4–11.4%), which was 1.5 (95% CI: 1.2–1.7) times that of non-Indigenous adults.

If First Nations adults living off reserve had the same diabetes prevalence as non-Indigenous adults, there would be a 46.7% (95% CI: 39.5–53.9%) reduction in the prevalence of diabetes among First Nations adults living off reserve and 24 740 (95% CI: 17 780–31 690) fewer cases of diabetes in the adult population in Canada.

Inuit adults had a diabetes prevalence of 4.7% (95% CI: 2.6–6.8%), which was not significantly different from the non-Indigenous population.

Cultural/Racial Background

At 14.4% (95% CI: 12.5–16.3%), diabetes prevalence among South Asian Canadians was 2.3 (95% CI: 2.0–2.6) times that of White Canadians. This represents 8.1 (95% CI: 6.2–10.0) more cases of diabetes among South Asian Canadians than White Canadians per 100 adults. Inequalities were significantly marked for South Asian men, who had a diabetes prevalence of 16.9% (95% CI: 14.0–19.9) compared with 11.5% among South Asian women (95% CI: 9.2–13.9) (Figure 2).

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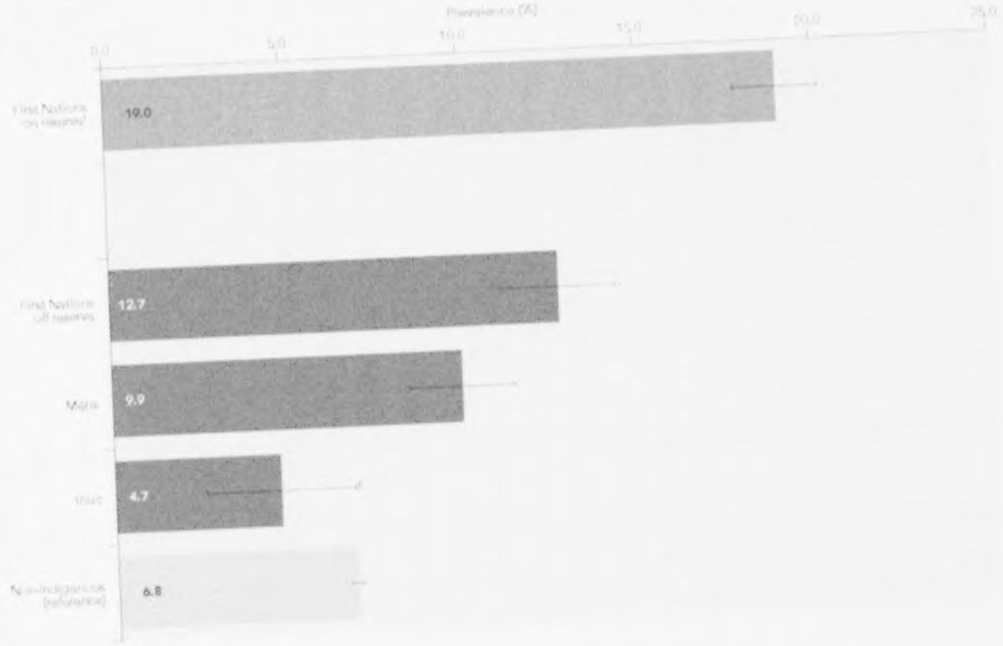
[30] RHS prevalence data are presented alongside CCHS data to approximate the magnitude of inequality between First Nations people living on reserve and in northern communities and the non-Indigenous population. Due to methodological limitations, inequality measures were not calculated for the RHS dataset.

FIGURE 1

Diabetes by Indigenous Identity, Canada, ages 18+ years, 2010–2013

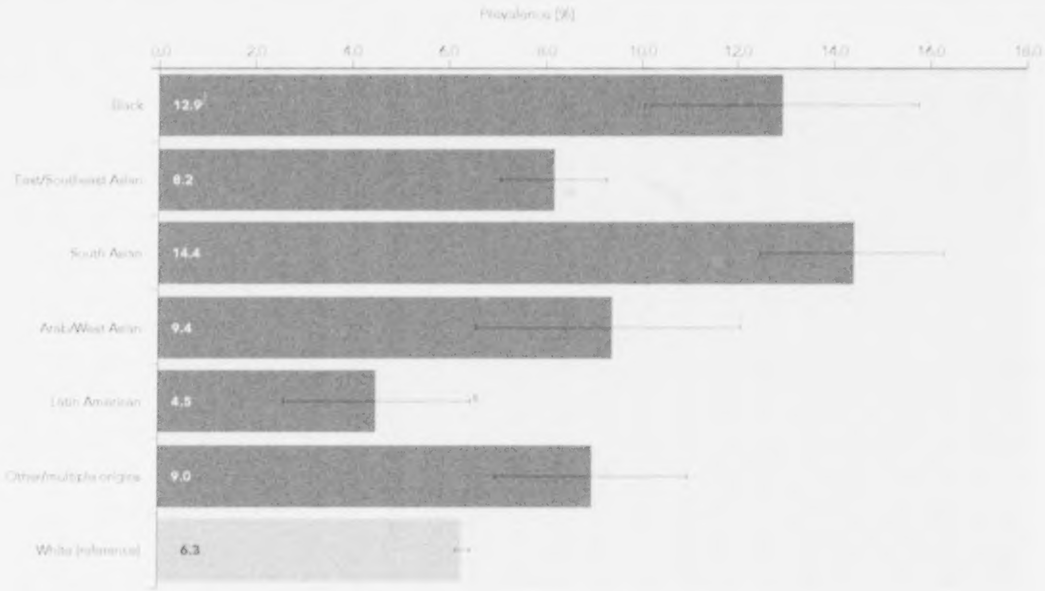


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
First Nations off reserve	1.9*	5.9*	46.7*	1.3*	0.1*	24 740*
Métis	1.5*	3.1*	31.6*	0.6*	0.0*	11 660*
Inuit	0.7E	−2.1E	NA	NA	NA	NA
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0

E: Reportable with caution
NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Sources: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013;
[1]First Nations Regional Health Survey (RHS) 2008–2010

FIGURE 2

Diabetes by Cultural/Racial Background, Canada, ages 18+ years, 2010–2013



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Black	2.1*	6.6*	51.3*	2.1*	0.2*	40 820*
East/Southeast Asian	1.3*	1.9*	23.2*	1.8*	0.1*	34 850*
South Asian	2.3*	8.1*	56.1*	4.4*	0.3*	84 760*
Arab/West Asian	1.5*	3.1*	32.7*	0.7*	0.0*	12 990*
Latin American	0.7E	−1.8E	NA	NA	NA	NA
Other/multiple origins	1.4*	2.7*	30.0*	0.7*	0.1*	14 040*
White [reference]	1.0	0.0	0.0	0.0	0.0	0

E: Reportable with caution
NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

If the prevalence of diabetes was the same among South Asian adults as among White adults, there would be a 56.1% (95% CI: 50.1–62.2%) reduction in diabetes prevalence among South Asian adults. This corresponds to a relative reduction of 4.4% (95% CI: 3.4–5.4%) in diabetes among Canadian adults as a whole and 84 760 (95% CI: 64 090–105 430) fewer cases of diabetes.

The prevalence of diabetes among Black adults was 12.9% (95% CI: 10.1–15.8%), which was 2.1 (95% CI: 1.6–2.5) times that of White adults. This equates to 6.6 (95% CI: 3.8–9.5) more cases of diabetes among Black adults than among White adults per 100 Canadian adults. If the prevalence of diabetes among Black adults was the same as for White adults, there would be a 51.3% (95% CI: 39.7–62.8%) reduction in diabetes among Black adults. This would result in 40 820 (95% CI: 22 490–59 150) fewer cases of diabetes among the adult population in Canada.

In contrast, the prevalence of diabetes among Latin American adults was lower than among White adults (4.5% versus 6.3%). However, this finding should be interpreted with caution due to high variability in the data.

Sexual Orientation (ages 18–59 years)

There were no statistically significant differences in the prevalence of diabetes by sexual orientation. Adults who identified as bisexual had a prevalence of diabetes of 4.9% (95% CI: 2.9–6.9%), which was 1.4 (95% CI: 0.9–2.0) times that of adults who identified as heterosexual (Annex 1). Because of the high variability in the data, however, these results should be interpreted with caution.

Immigrant Status

The diabetes prevalence among long-term (>10 years) immigrant adults was 7.7% (95% CI: 7.1–8.2%), which was 1.2 (95% CI: 1.1–1.3) times that of non-immigrant adults (Annex 1). The prevalence of diabetes among recent immigrants (≤10 years) was not significantly different from that of non-immigrant adults.

Income

The relationship between income and diabetes was inverse—as income increased, the prevalence of diabetes decreased. Adults living in the lowest income quintile area had a diabetes prevalence 2.0 (95% CI: 1.8–2.2) times that of Canadian adults in the highest income quintile area (Figure 3).

If the prevalence of diabetes among adults in the lowest income quintile area was as low as that among adults in the highest income quintile area, there would be a 50.1% (95% CI: 45.4–54.8%) reduction in the proportion of adults with diabetes in the lowest income quintile and a 13.4% (95% CI: 11.6–15.1%) reduction in the proportion of adults with diabetes nationally. This would, hypothetically, result in 248 270 (95% CI: 214 570–281 960) fewer cases of diabetes in Canada.

If the prevalence of diabetes among adults with the lowest income was as low as the prevalence for adults with the highest income, there would be a 13.4% reduction in overall diabetes prevalence and 248 270 fewer cases of diabetes in Canada.

While the prevalence of diabetes among adults in all income quintiles was higher for men than for women, the income gradient was steeper for women than for men. In other words, while the prevalence of diabetes among women in the lowest income quintile area was 2.4 (95% CI: 2.0–2.8) times that of women in the highest income quintile area, this prevalence among men in the lowest income quintile area was 1.9 (95% CI: 1.7–2.1) times that of men in the highest income quintile area (Figure 3).

Education (ages 20+ years)

As with income, the relationship between education level and diabetes prevalence was inverse. Diabetes prevalence among adults who had not completed high school was 10.2% (95% CI: 9.5–10.8%). This was 2.1 (95% CI: 1.9–2.3) times the prevalence among university graduates (Figure 4).

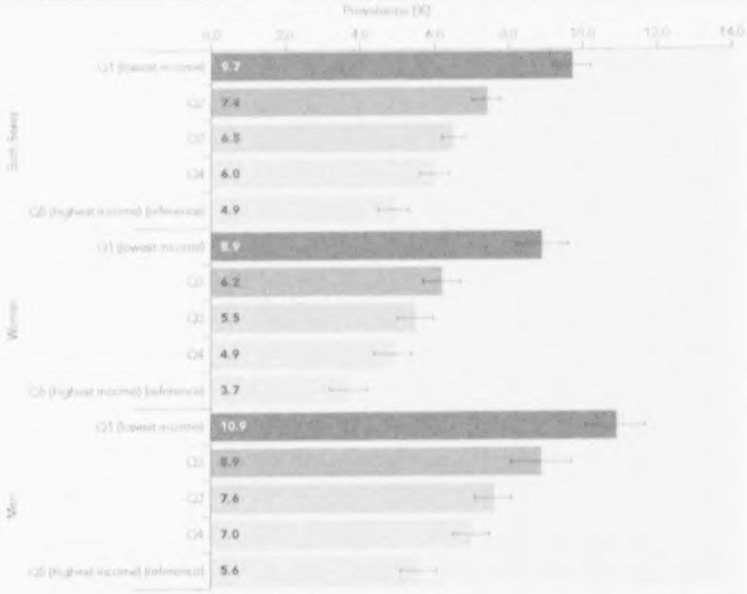
If the prevalence of diabetes among adults with the lowest level of education was as low as that of adults with the highest level of education, there would be a 51.7% (95% CI: 47.3–56.1%) reduction in this prevalence among adults who had not completed high school and a 10.0% (95% CI: 8.7–11.3%) reduction in the overall prevalence nationally. This would potentially result in 180 500 (95% CI: 156 650–204 360) fewer cases of diabetes among adults (Figure 4).

If the prevalence of diabetes among adults with less than a high school education was as low as for university graduates, there would be 180 500 fewer cases of diabetes in Canada.

When stratified by education level, the diabetes inequality gradient was steeper among women than among men. Diabetes prevalence among women with less than a high school education was 2.9 (95% CI: 2.5–3.3) times that of women who graduated from university. In contrast, diabetes prevalence among men with less than a high school education was 1.7 (95% CI: 1.5–2.0) times that of men who were university graduates. However, at every education level, prevalence of diabetes was higher among men than among women.

FIGURE 3

Diabetes by Income Quintile and Sex/Gender, Canada, ages 18+ years, 2010–2013

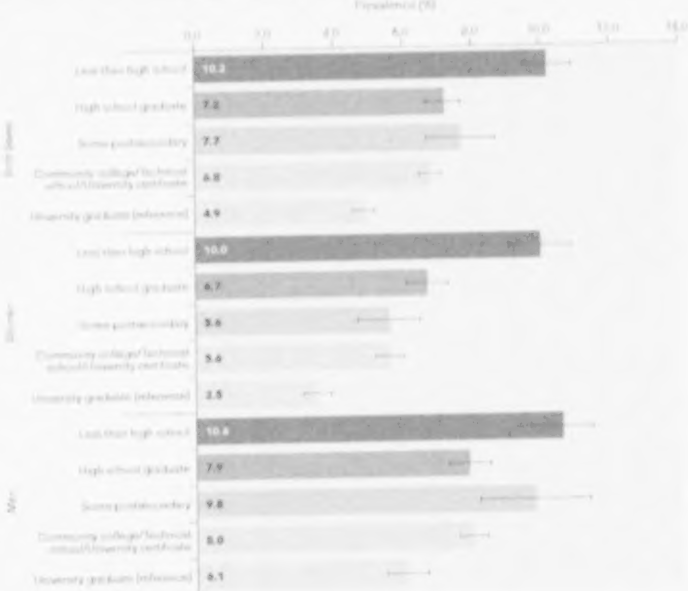


BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Q1 (lowest income)	2.0*	4.9*	50.1*	13.4*	0.9*	248 270*
Q2	1.5*	2.5*	34.4*	7.0*	0.5*	130 210*
Q3	1.3*	1.7*	25.5*	4.6*	0.3*	84 830*
Q4	1.2*	1.1*	18.7*	3.1*	0.2*	58 060*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Q1 (lowest income)	2.4*	5.2*	58.0*	18.7*	1.1*	152 430*
Q2	1.7*	2.4*	39.5*	8.2*	0.5*	66 750*
Q3	1.5*	1.7*	31.9*	5.5*	0.3*	44 580*
Q4	1.3*	1.1*	22.9*	3.4*	0.2*	27 620*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Q1 (lowest income)	1.9*	5.3*	48.6*	10.9*	0.9*	113 700*
Q2	1.6*	3.3*	36.9*	7.5*	0.6*	78 240*
Q3	1.4*	2.0*	26.0*	4.8*	0.4*	50 490*
Q4	1.2*	1.4*	19.9*	3.6*	0.3*	37 750*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

FIGURE 4

Diabetes by Education Level and Sex/Gender, Canada, ages 20+ years, 2010–2013



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Less than high school	2.1*	5.2*	51.7*	10.0*	0.7*	180 500*
High school graduate	1.5*	2.2*	31.4*	5.6*	0.4*	101 320*
Some postsecondary	1.6*	2.8*	36.1*	2.3*	0.2*	42 050*
Community college/Technical school/University certificate	1.4*	1.8*	27.4*	9.7*	0.7*	175 980*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Less than high school	2.9*	6.5*	65.1*	14.4*	0.8*	112 760*
High school graduate	1.9*	3.2*	48.0*	9.6*	0.6*	75 070*
Some postsecondary	1.6*	2.1*	37.5*	2.0*	0.1*	15 650*
Community college/Technical school/University certificate	1.6*	2.1*	37.6*	12.9*	0.8*	100 970*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Less than high school	1.7*	4.5*	42.5*	7.4*	0.6*	76 340*
High school graduate	1.3*	1.8*	22.7*	3.8*	0.3*	38 720*
Some postsecondary	1.6*	3.7*	38.1*	2.8*	0.2*	28 860*
Community college/Technical school/University certificate	1.3*	2.0*	24.5*	9.0*	0.7*	92 760*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2009–2013

Employment Status and Occupation

The prevalence of diabetes among adults permanently unable to work was 14.6% (95% CI: 12.8–16.5%). This was 2.9 (95% CI: 2.5–3.3) times the prevalence of diabetes among employed adults (i.e. those who had a job in the previous week). For all occupational groups, diabetes prevalence was significantly higher among men than among women (Figure 5).

If the prevalence of diabetes among adults permanently unable to work was the same as that among employed adults, there would be a 65.5% (95% CI: 60.8–70.2%) reduction in the prevalence of diabetes among those permanently unable to work and a 4.8% (95% CI: 3.8–5.8%) decrease in overall prevalence of diabetes nationally. This would result in 70 370 (95% CI: 55 940–84 800) fewer cases of diabetes in Canada.

As was the case for income and education, the inequality gradient for employment status was stronger among women than among men. Among women who were permanently unable to work, diabetes prevalence was 3.7 (95% CI: 3.0–4.3) times that of women who had a job in the previous week. Among men who were permanently unable to work, diabetes prevalence was 2.6 times (95% CI: 2.1–3.1) that of men who had a job in the previous week. The difference between men and women was not statistically significant.

There was an inequality gradient for diabetes among occupational groups for diabetes. Among adults in unskilled or semiskilled occupations and skilled, technical, and supervisory positions, the prevalence of diabetes was 7.0% (95% CI: 5.8–8.1%), 5.7% (95% CI: 5.2–6.2%), and 4.8% (95% CI: 4.4–5.2%), respectively. The diabetes prevalence among adults in unskilled occupations was 1.8 (95% CI: 1.5–2.2) times that of professionals; among adults in semiskilled occupations was 1.5 (95% CI: 1.3–1.7) times that of professionals; and among adults in skilled, technical, or supervisory positions was 1.3 (95% CI: 1.1–1.5) times that of professionals (Figure 6).

DATA GAPS/LIMITATIONS

The differences in diabetes prevalence among adults in various socioeconomic and sociodemographic groups constitute a comprehensive baseline measure of diabetes inequalities in Canada. Data gaps and limitations should be considered to better understand the estimated magnitude of inequalities and for any potential comparison or future monitoring of the reported results.

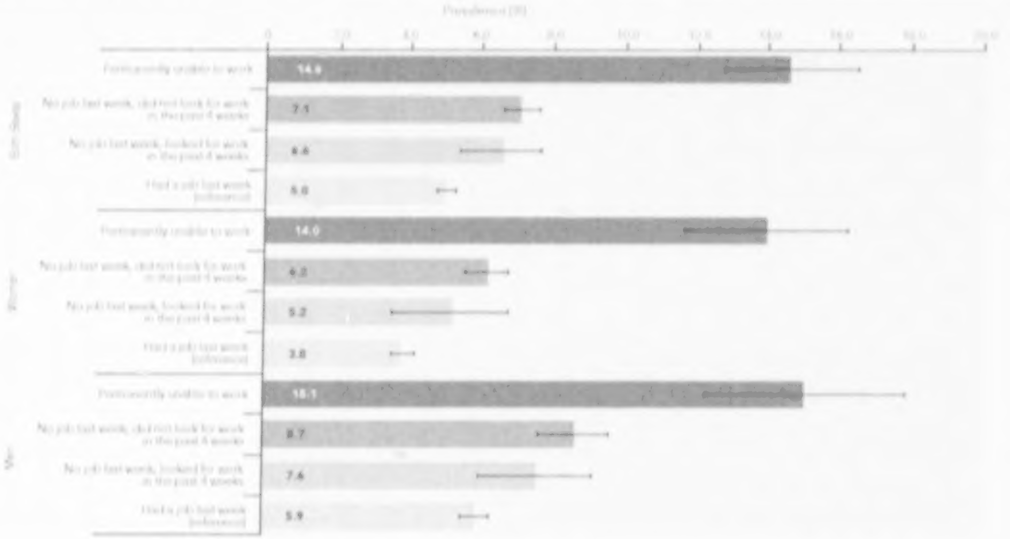
CCHS data are self-reported, which may lead to an underestimation of the prevalence of type 1 and type 2 diabetes in Canada. The Canadian Health Measures Survey estimated that more than 20% of type 2 diabetes cases are undiagnosed (3,8). Although the CCHS estimated the prevalence of diabetes as 6.9% based on self-reporting, the Canadian Chronic Disease Surveillance System (CCDSS), which uses administrative health data, estimated that 9.8% of adults (ages 20+ years) were diagnosed with diabetes in 2011–2012 (1). This raises the possibility that under-reporting of diabetes in the CCHS varied by subpopulations, which would affect the magnitude of the observed inequalities.

Moreover, data collected for diabetes and other chronic conditions assumes a diagnosis by a health professional, which is often harder to obtain in remote communities due to reduced access to health professionals who can make these diagnoses. This may result in a possible underestimation of diabetes prevalence as well as the size of inequalities reported for some population groups by Indigenous identity or by rural/urban residence.

While this analysis reports on the combined prevalence of type 1 and type 2 diabetes, most diabetes cases in Canada are type 2. According to other research, type 1 diabetes does not show the same socioeconomic gradient as type 2 diabetes (9). The inclusion of type 1 diabetes data does therefore tend to decrease the estimated inequalities associated with type 2 diabetes.

FIGURE 5

Diabetes by Employment Status and Sex/Gender, Canada, ages 18–75 years, 2010–2013

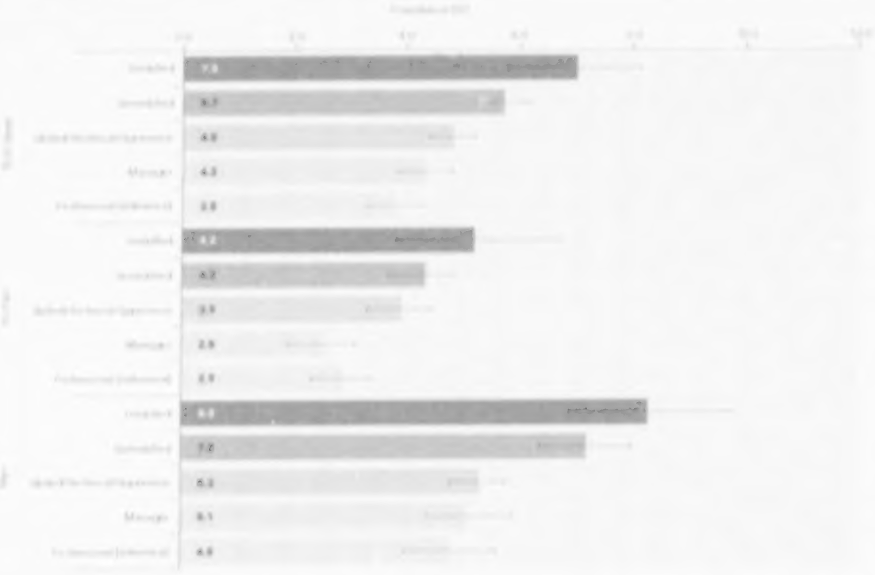


BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Permanently unable to work	2.9*	9.6*	65.5*	4.8*	0.3*	70 370*
Did not have a job last week, did not look for work in past 4 weeks	1.4*	2.0*	28.5*	7.6*	0.4*	112 420*
Did not have a job last week, looked for a job in past 4 weeks	1.3*	1.5*	23.2*	1.2*	0.1*	17 050*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Permanently unable to work	3.7*	10.2*	72.7*	6.2*	0.3*	38 230*
Did not have a job last week, did not look for work in past 4 weeks	1.6*	2.3*	38.0*	13.2*	0.6*	80 720*
Did not have a job last week, looked for a job in past 4 weeks	1.4	1.3	26.1	1.1[E]	0.1[E]	6 890[E]
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Permanently unable to work	2.6*	9.2*	61.0*	3.9*	0.3*	33 030*
Did not have a job last week, did not look for work in past 4 weeks	1.5*	2.8*	31.9*	7.0*	0.5*	59 010*
Did not have a job last week, looked for a job in past 4 weeks	1.3*	1.7	22.0*	1.2*	0.1*	10 120*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0

E: Reportable with caution
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

FIGURE 6

Diabetes by Occupation and Sex/Gender, Canada, ages 18–75 years, 2010–2013



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Unskilled	1.8*	3.2*	45.8*	4.5*	0.2*	55 970*
Semiskilled	1.5*	1.9*	33.8*	7.1*	0.4*	89 240*
Skilled/Technical/Supervisor	1.3*	1.1*	22.0*	5.1*	0.3*	63 870*
Manager	1.1	0.5	12.0	0.8	0.0	9 410
Professional [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Unskilled	1.8*	2.4*	45.0*	4.1*	0.2*	20 420*
Semiskilled	1.5*	1.4*	32.5*	6.8*	0.3*	34 010*
Skilled/Technical/Supervisor	1.4*	1.1*	27.0*	4.7*	0.2*	23 820*
Manager	0.9	–0.4	NA	NA	NA	NA
Professional [reference]	1.0	0	0	0	0	0
MEN						
Unskilled	1.7*	3.5*	42.3*	4.2*	0.3*	31 140*
Semiskilled	1.5*	2.4*	33.3*	7.1*	0.5*	51 920*
Skilled/Technical/Supervisor	1.1	0.5	9.2	2.5	0.2	18,170
Manager	1.1	0.3	6.5	0.5	0.0	3 720
Professional [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
*: Significantly different from reference population
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

Diabetes prevalence reflects both the number of new cases diagnosed (incidence) and the length of survival with diabetes (duration). Some population groups may have both a high diabetes incidence rate and a high mortality rate, which would lead to an underestimation of the inequitable diabetes burden faced by these groups based on diabetes prevalence alone. In addition, population groups differ in age at the onset of diabetes. For example, First Nations people tend to be diagnosed with diabetes at an earlier age (3), increasing the burden that diabetes places on this population group. There is also evidence that outcomes are worse for First Nations and Métis people who have diabetes compared with non-Indigenous people who have diabetes (10). This suggests that inequalities for these population groups are greater than our prevalence data indicated.

Because the data presented are cross-sectional, inferring causality is not possible. For example, diabetes prevalence was higher among adults who were unable to work. While this may be because those who were unable to work were at an increased risk of developing diabetes, it may also be that diabetes interfered with people's ability to work. The current analysis was meant to capture the depth and impact of inequalities in diabetes prevalence on different socially stratified groups at a given point in time. The disproportionate burden of diabetes in certain groups is driven by a complex system of social and structural drivers of health that remain to be fully explored and understood.

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (7), calculating *p*-values would confirm statistically significant differences.

Because the measures quantify the inequalities experienced by defined social groups, these results do not capture the heterogeneous nature of these groups. For example, more accurate identification of immigrants by their country of origin would better reveal different inequalities among immigrants. Diabetes prevalence among some groups may be over- or underestimated due to these broad groupings (11). The use of a combined cultural and racial background grouping can also lead to an over- or underestimation of diabetes prevalence among heterogeneous groups that were captured under a single social categorization (12) and among Indigenous groups. In the latter case, diabetes prevalence varied considerably among First Nations communities (13). Moreover, the inequalities facing individuals and communities with multiple and intersecting social identities were not captured.

DISCUSSION

Diabetes imposes considerable chronic disease burden on Canadians, and this burden is not distributed equally across socioeconomic and sociodemographic groups. The most substantial relative inequalities were found in the following areas: Indigenous identity, cultural/racial background, education level (with gender differences observed), and income.

Diabetes was 1.3 times more prevalent among men than among women in all social groups. However, the magnitude of inequalities in diabetes prevalence across socioeconomic status was higher among women. Based on measured fasting blood glucose, the Canadian Health Measures Survey indicated that the prevalence of diabetes (both diagnosed and previously undiagnosed) was 37% higher for men 20 years and older than for women of the same age (8). These higher diabetes rates in men, which have been widely reported, are because men tend to develop diabetes at a lower average body mass index (BMI) than women and are more resistant to insulin at the same BMI as women (14).

The prevalence of diabetes among First Nations adults living both on and off reserve was significantly higher than that of non-Indigenous adults in Canada (Box 1). A recent study in the United States of America (USA) also noted elevated prevalence of diabetes among American Indians (15). A recent study of First Nations adults living in Alberta estimated that the lifetime risk of developing diabetes at age 20 years was 87% among women and 76% among men (13). In

BOX 1

FOCUS ON FIRST NATIONS PEOPLE LIVING ON RESERVE AND IN NORTHERN COMMUNITIES–CONTEXTUALIZING RESULTS FROM THE FIRST NATIONS REGIONAL HEALTH SURVEY

Prepared by the First Nations Information Governance Centre

The prevalence of type 2 diabetes among First Nations people reflects the longstanding effects of colonization that disrupted the transmission of culture across generations and resulted in physical changes to the environments of their communities (18). These changes include the urbanization of traditional lands and the construction of government-controlled reserves and policies, such as the pass system (19,20). These changes not only displaced First Nations people, but , because of mobility limitations and habitat destruction (e.g., foresting, pollutants from agricultural runoff), diminished the availability and accessibility of plant/animal species(19).First Nations people became thwarted from engaging in their traditionally active lifestyles that included harvesting, gathering, and travelling for animal migration and/or trade (19). This lifestyle not only provided nourishment, a connection to culture, and a source of social and physical activity, but was also a source of economic sustenance. The limited mobility, coupled with the increased availability of Western diets high in sugar-dense foods, contributed to the present-day prevalence of overweight/obesity among First Nations people. High BMIs are a key risk factor for type 2 diabetes (21,22). The remote and/or rural nature of many First Nations communities, as well as the diminished economic resources available to them, also created barriers for socioeconomic development, including accessible health care services that could help treatment and prevention of type 2 diabetes and complications associated with the condition (e.g. poorer oral health, amputations) (23,24). Furthermore, these barriers, along with the disconnection from culture, create chronic sources of stress that increases the prevalence of other risk factors for type 2 diabetes, such as high blood pressure and cigarette smoking (18,22).

comparison, the lifetime risk of developing diabetes at age 20 years among non-Indigenous women and men was 47% and 56%, respectively (16). While provincial studies of diabetes in First Nations people living on and off reserve using administrative data sources have noted a higher prevalence of diabetes among women than among men (16,17), our results for First Nations people living off reserve did not show differences by sex/gender. This may be due to different populations or methodologies applied in these studies compared with our analysis.

The major dietary and lifestyle changes that First Nations peoples in Canada have undergone over the last three-quarters of a century have resulted in high obesity rates and may have contributed to the rise in diabetes prevalence (25). The debate about the relative importance of genetic factors (e.g. HNF1 G319S polymorphism in Oji-Cree) versus environmental factors associated with the increased diabetes risk among First Nations people continues (26). The earlier onset of diabetes in the Indigenous population than in the non-Indigenous population may partly explain the higher mortality rate due to diabetes complications, such as end-stage renal disease, among First Nations people (27). Health care disparities such as less frequent diagnostic testing (e.g. A1C and LDL cholesterol) of First Nations people than of non-First Nations people may also be a contributing factor (28).

While the prevalence of diabetes among Inuit adults was lower than among non-Indigenous adults, this finding should be interpreted with caution due to considerable variability in the data. However, the CCHS estimates are similar to estimates derived from the International Polar Year Inuit Health Survey from 2007–2008 (29) and the 2012 Aboriginal Peoples Survey (30).

Although long-term immigrants had a higher prevalence of diabetes, the prevalence among recent immigrants was comparable to that of non-immigrants. The health status of recent immigrants is generally better than the health status of adults born in Canada (known as the "healthy immigrant" effect); however, health status declines the longer that recent immigrants live in Canada (31).

Diabetes prevalence in Canada was significantly higher among Black, South Asian, and Arab/West Asian adults than among White adults, similar to previous research which found that being non-White in Canada was associated with a higher diabetes incidence (32). In the USA, Black, mixed race, and Hispanic populations have higher diabetes rates than White populations. However, the difference between people who immigrated to or were born in the USA was not statistically significant (33). In the USA, diabetes prevalence was higher among Latin American adults than among White adults (34,35). Note that the methods for collecting race/ethnicity data are not necessarily standard across studies, databases, or reports.

Diabetes prevalence was lowest among professional workers and highest among unskilled workers. A similar pattern was observed for diabetes mortality among a 1991 Census of Canada cohort (36). Income and education level were inversely related to diabetes prevalence. Similarly, an earlier Canadian report found an inverse association between income and diabetes, with odds ratios almost double for men and almost triple for women in the lowest income category compared with men and women in the highest income category (37). Among both Australians and Americans, more people at a lower socioeconomic status were found to have diabetes than those at higher socioeconomic status (38,39).

The prevalence of diabetes, a major cause of morbidity and mortality in Canada, is expected to continue increasing over the next decade (40). The prevalence of the many physical and mental health complications that result from or are associated with diabetes—heart disease, stroke, blindness, kidney failure, lower limb amputation, and depression, among others—are also expected to increase.

Inequalities in diabetes exist across a range of social stratifications, including employment status, occupation, ethnicity, and Indigenous identity. There is also a socioeconomic gradient in diabetes prevalence, with rates increasing as incomes and education levels decrease. The higher prevalence observed in some populations may reflect differences in individual risk factors, for example, age, nutrition, smoking, and physical inactivity, that are strongly affected by income, education, food security, the built environment, and other social determinants of health.

The systematic measurement of health inequalities of Canadian adults living with diabetes helps to inform and strengthen existing interventions to reduce the revealed differences and related impacts. However, fully addressing these inequalities will also require policy interventions that affect broader influences such as poverty and socioeconomic inequalities, built environments, access to healthy and affordable foods, and access to services, to name just a few (3). Ongoing monitoring of the inequalities in diabetes across sociodemographic and socioeconomic groups is crucial to inform programs, policies, and research and to identify changes in the epidemiology of diabetes and its determinants over time.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Diabetes, excluding gestational. Data Source: CCHS 2010–2013

					SUMMARY MEASURES									POPULATION IMPACT MEASURES								
Social Stratifiers		Age-Standardized Prevalence (%)			Prevalence Rate Ratio (RR)			Prevalence Rate Difference (RD) per 100			Attributable Fraction (AF%)			Population Attributable Fraction (PAF%)			Population Attributable Rate (PAR) per 100			Population Impact Number (PIN)		
		Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males
Overall	Both Sexes	[illegible]	[illegible]	[illegible]	NA									NA								
Population Groups																						
Sex/Gender	Male	[illegible]	NA		NA	NA	[illegible]	NA	NA	[illegible]	NA	NA	[illegible]	NA	NA	[illegible]	NA	NA	[illegible]	NA	NA	[illegible]
	Female (reference)	[illegible]			Reference																	
Indigenous identity	First Nations off-reserve	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Métis	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Inuit	[illegible]	[illegible]	F	[illegible]	[illegible]	F	[illegible]	[illegible]	F	NA	NA	F	NA	NA	F	NA	NA	F	NA	NA	F
	Non-Indigenous (reference)	[illegible]	[illegible]	[illegible]	Reference																	
Cultural/racial background	Black	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	East/Southeast Asian	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	South Asian	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Arab/West Asian	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Latin American	[illegible]	[illegible]	F	[illegible]	[illegible]	F	[illegible]	[illegible]	F	NA	NA	F	NA	NA	F	NA	NA	F	NA	NA	F
	Other/Multiple origins	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	White (reference)	[illegible]	[illegible]	[illegible]	Reference																	
Sexual Orientation (aged 18–59)	Bisexual	[illegible]	F	[illegible]	[illegible]	F	[illegible]	[illegible]	F	[illegible]	[illegible]	F	[illegible]	[illegible]	F	[illegible]	[illegible]	F	[illegible]	[illegible]	F	[illegible]
	Lesbian/Gay	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	NA	NA	[illegible]	NA	NA	[illegible]	NA	NA	[illegible]	NA
	Heterosexual (reference)	[illegible]	[illegible]	[illegible]	Reference																	
Immigrant status	Recent	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]	NA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]
	Long-term	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Non-immigrant (reference)	[illegible]	[illegible]	[illegible]	Reference																	
Rural/urban residence	Remote areas	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]	NA	[illegible]	[illegible]	NA	[illegible]	[illegible]	NA
	Provincial rural areas	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Small urban centres	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Toronto, Montréal and Vancouver	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]	NA	[illegible]	[illegible]	NA	[illegible]	[illegible]	NA
	Large urban centres other than Toronto, Montréal and Vancouver (reference)	[illegible]	[illegible]	[illegible]	Reference																	
Socioeconomic Determinants of Health																						
Income quintile – provincial	Q1 (lowest income)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Q2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Q3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Q4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Q5 (highest income) (reference)	[illegible]	[illegible]	[illegible]	Reference																	
Education (aged 25+)	Less than high school	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	High school graduate	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Some postsecondary	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Community college/Technical school/University certificate	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	University graduate (reference)	[illegible]	[illegible]	[illegible]	Reference																	
Employment status (aged 18–75)	Permanently unable to work	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Not working last week, looked for work in the past 4 weeks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Not working last week, did not look for work in the past 4 weeks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Had a job last week (reference)	[illegible]	[illegible]	[illegible]	Reference																	
Occupation (aged 18–75)	Unskilled	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Semiskilled	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Skilled/Technical/Supervisor	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Manager	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]	NA	[illegible]	[illegible]	NA	[illegible]	[illegible]	NA	[illegible]
	Professional (reference)	[illegible]	[illegible]	[illegible]	Reference																	

NOTE:

The purpose of the colour scaling is to map (for all indicators and stratifiers) 1- the relative and absolute inequalities; 2- the patterns of inequalities (e.g. Indigenous populations frequently experience inequalities compared to non-Indigenous); 3- the gradients of inequalities (e.g. there are frequently inequalities in a gradient across income strata). The magnitude and distribution of inequalities shown in this table should be interpreted with caution, taking into consideration one indicator at a time, the differences among the data sources used (e.g. survey vs. administrative register), and existing limitations in the measurement of the social stratifiers.

Colour scaling for rate ratios below 1 and rate differences below 0 was applied using the reciprocal value and the absolute value respectively. For example, for a RR of 0.5, the colour scale applied is for the value 2.0 (1/0.5) and for a RD of -10, the colour scale for the value 10 is used. Colour scaling is only applied when the difference between the value and the reference group is statistically significant.

LEGEND

		RR	RD per 100		
Non-applicable	NA	≥ 2.3	≥ 15.2	▇	Larger Inequality
Non-reportable	F	1.7 → 2.3	10.5 → 15.2	▆	↕
Report with Caution	E	1.5 → 1.7	7.4 → 10.5	▅	
Statistically Significant	*	1.4 → 1.5	5.5 → 7.4	▄	
Reference	▨	1.3 → 1.4	4.4 → 5.5	▃	
		1.0 → 1.3	0.0 → 4.4	▁	Smaller Inequality

References

(1) Public Health Agency of Canada. How healthy are Canadians? A trend analysis of the health of Canadians from a healthy living and chronic diseases perspective [Internet]. Ottawa: Public Health Agency of Canada; 2016 [cited 2017 Apr 10]. Available from: https://www.canada.ca/content/dam/phac-aspc/documents/services/publications/healthy-living/how-healthy-canadians/pub1-eng.pdf.

(2) Whiting DR, Guariguata L, Weil C, Shaw J. IDF diabetes atlas: global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res Clin Pract. 2011;94(3):311-21.

(3) Public Health Agency of Canada. Diabetes in Canada: Facts and figures from a public health perspective [Internet]. Ottawa: Chronic Disease Surveillance and Monitoring Division; 2011 [cited 2017 Mar 09]. Available from: http://www.phac-aspc.gc.ca/cd-mc/publications/diabetes-diabete/facts-figures-faits-chiffres-2011/index-eng.php.

(4) Canadian Diabetes Association. An economic tsunami: the cost of diabetes in Canada [Internet]. Ottawa: Canadian Diabetes Association,; 2009 [cited 2017 Apr 10]. Available from: https://www.diabetes.ca/CDA/media/documents/publications-and-newsletters/advocacy-reports/economic-tsunami-cost-of-diabetes-in-canada-english.pdf;.

(5) Raphael D, Anstice S, Raine K, McGannon KR, Kamil Rizvi S, Yu V. The social determinants of the incidence and management of type 2 diabetes mellitus: are we prepared to rethink our questions and redirect our research activities? Leadership in Health Services. 2003;16(3):10-20.

(6) Hill J, Nielsen M, Fox MH. Understanding the social factors that contribute to diabetes: a means to informing health care and social policies for the chronically ill. Perm J. 2013 Spring;17(2):67-72.

(7) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(8) Rosella LC, Lebenbaum M, Fitzpatrick T, Zuk A, Booth GL. Prevalence of Prediabetes and Undiagnosed Diabetes in Canada (2007-2011) According to Fasting Plasma Glucose and HbA1c Screening Criteria. Diabetes Care. 2015 Jul;38(7):1299-305.

(9) Evans J, Newton RW, Ruta DA, MacDonald TM, Morris AD. Socio economic status, obesity and prevalence of Type 1 and Type 2 diabetes mellitus. Diabetic Med. 2000;17(6):478-80.

(10) Ghosh H, Spitzer D. Inequities in Diabetes Outcomes among Urban First Nation and Métis Communities: Can Addressing Diversities in Preventive Services Make a Difference? International Indigenous Policy Journal. 2014;5(1).

(11) Chen J, Ng E, Wilkins R. The health of Canada's immigrants in 1994-95. Health rep. 1996 Spring;7 Cat. no. 82-003(4):33-46.

(12) Edwards C, Fillingim R, Keefe F. Race, ethnicity and pain. Pain. 2001 Nov;94(2):133-7.

(13) Oster RT, Grier A, Lightning R, Mayan MJ, Toth EL. Cultural continuity, traditional Indigenous language, and diabetes in Alberta First Nations: a mixed methods study. International journal for equity in health. 2014;13(1):92.

(14) Sattar N. Gender aspects in type 2 diabetes mellitus and cardiometabolic risk. Best practice & research Clinical endocrinology & metabolism. 2013;27(4):501-7.

(15) Indian Health Service Division of Diabetes Treatment and Prevention. Diabetes in American Indians and Alaska Natives: Facts At-a-Glance [Internet]. Washington: U.S. Department of Health and Human Services; 2012 Jun [cited 2017 Apr 10]. Available from: http://www.ihs.gov/MedicalPrograms/Diabetes/HomeDocs/Resources/FactSheets/Fact_sheet_AIAN_508c.pdf.

(16) Turin TC, Saad N, Jun M, Tonelli M, Ma Z, Barnabe CC, et al. Lifetime risk of diabetes among First Nations and non-First Nations people. CMAJ. 2016 Nov 1;188(16):1147-53.

(17) Dyck R, Osgood N, Lin TH, Gao A, Stang MR. Epidemiology of diabetes mellitus among First Nations and non-First Nations adults. CMAJ. 2010 Feb 23;182(3):249-56.

(18) Public Health Agency of Canada. [Internet]. Ottawa: Public Health Agency of Canada; 2011. Chapter 6 - Diabetes among First Nations, Inuit, and Métis populations in Diabetes in Canada: Facts and figures from a public health perspective [updated 2011 Dec 15; cited 2017 Sep 29]; [about 22 screens]. Available from: https://www.canada.ca/en/public-health/services/chronic-diseases/reports-publications/diabetes/diabetes-canada-facts-figures-a-public-health-perspective/chapter-6.html#endnote53.

(19) Assembly of First Nations. Traditional Foods: Are they Safe for First Nations Consumption?[Internet]. Ottawa: Assembly of First Nations; 2017 [cited 2017 Sep 29]. Available from: http://www.afn.ca/uploads/files/rp-traditional_foods_safety_paper_final.pdf.

(20) Snyder M, Wilson K, Whitford J. Examining the Urban Aboriginal Policy Gap: Impacts on Service Delivery for Mobile Urban Aboriginal Peoples in Winnipeg, Canada. aboriginal policy studies. 2015;5(1).

(21) Turner NJ, Turner KL. Traditional food systems, erosion and renewal in Northwestern North America. 2007.

(22) Government of Canada. [Internet]. Ottawa: Government of Canada; 2015. Type 2 Diabetes [updated 2015 Dec 17; cited 2017 Sep 29]; [about 2 screens]. Available from: https://www.canada.ca/en/public-health/services/diseases/type-2-diabetes.html.

(23) Reading J. A life course approach to the social determinants of health for Aboriginal peoples. Ottawa (ON): Senate Sub-Committee on Population Health. 2009.

(24) Carrière G, Garner R, Sanmartin C, LHAD Research Team. Acute-care hospitalizations and Aboriginal identity in Canada, 2001/2002. Health Research Working Paper.Ottawa (ON): Statistics Canada. 2010.

(25) Haman F, Fontaine-Bisson B, Batal M, Imbeault P, Blais J, Robidoux M. Obesity and type 2 diabetes in Northern Canada's remote First Nations communities: the dietary dilemma. Int J Obes. 2010;34(S2):S24.

(26) Southam L, Soranzo N, Montgomery S, Frayling T, McCarthy M, Barroso I, et al. Is the thrifty genotype hypothesis supported by evidence based on confirmed type 2 diabetes-and obesity-susceptibility variants? Diabetologia. 2009;52(9):1846-51.

(27) Jiang Y, Osgood N, Lim HJ, Stang MR, Dyck R. Differential mortality and the excess burden of end-stage renal disease among First Nations people with diabetes mellitus: a competing-risks analysis. CMAJ. 2014 Feb 4;186(2): 103-9.

(28) Deved V, Jette N, Quan H, Tonelli M, Manns B, Soo A, et al. Quality of care for First Nations and non-First Nations People with diabetes. Clin J Am Soc Nephrol. 2013 Jul;8(7):1188-94.

(29) Egeland GM, Cao Z, Young TK. Hypertriglyceridemic-waist phenotype and glucose intolerance among Canadian Inuit: the International Polar Year Inuit Health Survey for Adults 2007-2008. CMAJ. 2011 Jun 14;183(9):E553-8.

(30) Statistics Canada. [Internet]. Ottawa: Statistics Canada; 2014. Aboriginal Peoples Survey [updated 2015 Nov 30; cited 2017 Apr 10]; [about 24 screens]. Available from: http://www.statcan.gc.ca/pub/89-653-x/89-653-x2014003-eng.htm#a2.

(31) Ng E. The healthy immigrant effect and mortality rates. Health Reports. 2011;22(4):C1.

(32) Rosella LC, Mustard CA, Stukel TA, Corey P, Hux J, Roos L, et al. The role of ethnicity in predicting diabetes risk at the population level. Ethn Health. 2012;17(4):419-37.

(33) Beckles GL, Chou C. Diabetes: United States from 2006-2010. MMWR. 2013;62(3): 99-104.

(34) Centres for Disease Control and Prevention. [Internet]. Atlanta: CDC; 2017. Diabetes home 2014: data and Statistics [updated 2017 Jul 17; cited 2017 Apr 10]; [about 2 screens]. Available from: https://www.cdc.gov/diabetes/data/.

(35) Wang Y, Beydoun MA. The obesity epidemic in the United States--gender, age, socioeconomic, racial/ethnic, and geographic characteristics: a systematic review and meta-regression analysis. Epidemiol Rev. 2007;29:6-28.

(36) Tjepkema M, Wilkins R, Long A. Cause-specific mortality by income adequacy in Canada: A 16-year follow-up study. Health reports. 2013;24(7):14.

(37) Dinca-Panaitescu S, Dinca-Panaitescu M, Bryant T, Daiski I, Pilkington B, Raphael D. Diabetes prevalence and income: results of the Canadian Community Health Survey. Health Policy. 2011;99(2):116-23.

(38) Australian Institute of Health and Welfare. Australia's health 2014 [Internet]. Canberra: Australian Institute of Health and Welfare; 2014 [cited 2017 Apr 10]. Available from: http://www.aihw.gov.au/australias-health/2014/.

(39) Rabi DM, Edwards AL, Southern DA, Svenson LW, Sargious PM, Norton P, et al. Association of socio-economic status with diabetes prevalence and utilization of diabetes care services. BMC Health Services Research. 2006;6(1):124.

(40) Diabetes Canada. [Internet]. Toronto: Canadian Diabetes Association; 2017. Diabetes Statistics in Canada [updated 2017 cited 2017 Apr 10]; [about 4 screens]. Available from: http://www.diabetes.ca/how-you-can-help/advocate/why-federal-leadership-is-essential/diabetes-statistics-in-canada.

INEQUALITIES IN
DISABILITY IN CANADA

INEQUALITIES HIGHLIGHTS

- The prevalence of disability among unemployed Canadians is 3.2 times this prevalence among employed Canadians. This corresponds to 13.7 more Canadians living with disability per 100 adults among employed versus employed Canadians.
- The prevalence of disability among adults who are unemployed and still in the labour force is 1.9 times that of employed Canadians. This means there are 5.4 more cases of disability among those who are unemployed and still in the labour force compared with those who are employed per 100 adults.
- The prevalence of disability is higher among women than men. However, the inequality in disability prevalence is higher among men (prevalence ratio [PR] = 4.1) than among women (PR = 2.7) when comparing unemployed adults with employed adults. This means there are 18.2 and 11.2 more men and women per 100 people living with disability who are not in the labour force, respectively, than men and women who are currently employed.
- Inequalities in disability in Canada are particularly apparent between socioeconomic groups. Adults with less than a high school education have 11.3 more cases of disability per 100 people than university graduates, which is 2.2 times the prevalence of disability of university graduates. Canadians in the lowest income group have 9.1 more cases of disability per 100 people than Canadians in the highest income group. This is 1.9 times the prevalence of disability of Canadians in the highest income.
- Indigenous peoples (excluding First Nations people living on reserve and in northern communities) have a prevalence of disability 1.6 times that of non-Indigenous people. This means there are 8.0 more Indigenous adults living with disability than non-Indigenous adults per 100 people. The inequality in disability is 1.8 times higher among Indigenous women and 1.3 times higher among Indigenous men than non-Indigenous men and women. For every 100 people, this corresponds to 11.5 and 4.1 more Indigenous women and men living with disability, respectively, than their non-Indigenous counterparts.

ACRONYM	FULL NAME
CI	Confidence Interval
CRPD	Convention on the Rights of Persons with Disabilities
CSD	Canadian Survey on Disability
NHS	National Household Survey
PR	Prevalence Ratio
RHS	First Nations Regional Health Survey

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

In 2012, more than 11% of Canadians aged 15 years or older reported having at least one of the three most prevalent types of disability that limit daily activities: pain, mobility, and flexibility. Over one-quarter (26%) of those who self-identified as disabled were categorized as having a "very severe" disability (1).

Impairments leading to disability can be present at birth, develop over time, or be caused by an event such as an injury. Moreover, there are many different forms of disability that range in severity depending on the context (i.e. whether conditions are enabling or disabling).

A wide range of theoretical and methodological approaches conceptualize and measure disability (2). Traditional "medical models" tend to define disability as a biological disease or deficit that can be ameliorated through medical intervention or technology (2,3). In contrast, more recent "social models" of disability shift the focus away from individual health conditions or physical, sensory, or cognitive impairments toward social and environmental barriers that, when encountered by someone with an impairment, result in disability. In this view, disability is not an individual deficit but the product of disabling social conditions that disadvantage and exclude people with impairments from full social and economic participation (4,5).

The Canadian Survey on Disability (CSD), from which the results of this chapter are derived, describes disability as an outcome of the interaction between the day-to-day activity limitations that a person faces because of the structure and functioning of their body and the social, environmental, and physical barriers they encounter in everyday life (1). This definition is based on the social model of disability (6). Similarly, according to the United Nations Convention on the Rights of Persons with Disabilities (CRPD), "persons with disabilities" includes "those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others." In 2010, Canada ratified the CRPD, which obliges signatory nations "to promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities, and to promote respect for their inherent dignity" (7).

Inequalities in disability intersect with income, education, social supports and networks, and social exclusion in complex ways that have yet to be fully explored and understood (8-10). In Canada, people with disabilities are more likely to live in poverty and isolation for reasons that include, but are not limited to, the lack of necessary social and structural supports (11). People with disabilities may encounter barriers to obtaining a quality education, maintaining employment, and participating in their wider community (12). They also face higher unemployment rates than people who do not have disabilities. This has a dual impact. First, it increases societal costs associated with unemployment while depriving people with disabilities of income and other social benefits of employment, subjecting them to greater rates of poverty (13). Second, disability can combine with many other marginalized social identities (e.g. age, race/ethnicity, immigrant status) to create unique barriers and compound inequalities for different subgroups of people with disabilities. Researchers in the field of disability studies are increasingly adopting intersectional approaches to better identify and understand these different experiences (14,15).

Because of these strong links to health and social inequalities, disability was selected as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter).

METHODS

Data on prevalence of disability and stratifier variables were collected through the CSD 2012 cycle. Survey respondents were aged 15 years and older and were not living in a collective dwelling such as a long-term care facility, residence for senior citizens, or group home. The CSD sample was chosen from among those who had responded in the affirmative to a series of participation and activity limitation filter questions in the National Household Survey (16). These questions asked respondents if they were limited in their daily activities (e.g. hearing, seeing, communicating, walking, learning) or had a physical or mental condition or health problem that reduced the amount or kinds of activities they could participate in at home, at work, at school, or in their day-to-day life (17). The CSD further applied a Disability Screening Questions module to confirm the presence of disability according to a social model and to assess the severity of the respondent's disability (mild, moderate, severe, very severe) (17). Disability was operationalized in the CSD as anyone who reported being "sometimes," "often," or "always" limited in their daily activities due to a self-reported long-term condition or health problem. Alternatively, they could be "rarely" limited if they were unable to do certain tasks or could only do them with a lot of difficulty. In order to capture the social and environmental aspects of disability, the CSD asked respondents about their education and employment experiences as well as their use of aids or assistants in day-to-day activities (17).

Inequalities were assessed by examining differences in the prevalence of disability according to social stratifiers grouped under socioeconomic and sociodemographic stratifiers. Sociodemographic stratifiers include sex/gender, Indigenous identity[31], visible minority status, immigrant status, and rural/urban residence. Socioeconomic stratifiers include income, education (ages 20+ years), and employment status (ages 15–64 years). It was not possible to stratify disability by sexual orientation as the CSD does not capture this information.

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

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[31] Indigenous identity refers specifically to those who self-identified as First Nations living off reserve, Métis, or Inuit, but excludes First Nations living on reserve. For this analysis, Indigenous identity is measured by two categories: Indigenous and non-Indigenous. The Indigenous people category combines First Nations people living off reserve with Métis, Inuit, and people who reported more than one Indigenous identity. For information on disability among First Nations people living on reserve and in northern communities, see Box 1.

Inequality measures are reported along with their 95% confidence intervals (CIs). Statistical significance was assessed using 95% confidence intervals (18). Sex/gender-specific inequalities for stratifiers were reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable fraction, population attributable rate, and population impact number.

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in Canada. (For more detailed information, see the Methodology chapter).

FINDINGS

Statistically significant inequalities were found by sex/gender, Indigenous identity, immigrant status, income, education, employment status, occupation, and rural/urban residence. As no statistically significant inequalities were found by visible minority status, those results are not presented here. (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Sex/Gender

The prevalence of disability was 14.9% (95% CI: 14.6–15.2%) among women. This was 1.1 (95% CI: 1.1–1.2) times the prevalence among men (13.3%; 95% CI: 13.0–13.7%) (Table 3).

If the prevalence of disability among women was the same as among men, there would be a 10.6% (95% CI: 7.4–13.7%) reduction in the prevalence for women. This would, in theory, result in 219 460 (95% CI: 151 250–287 660) fewer cases of disability in Canada.

Indigenous Peoples

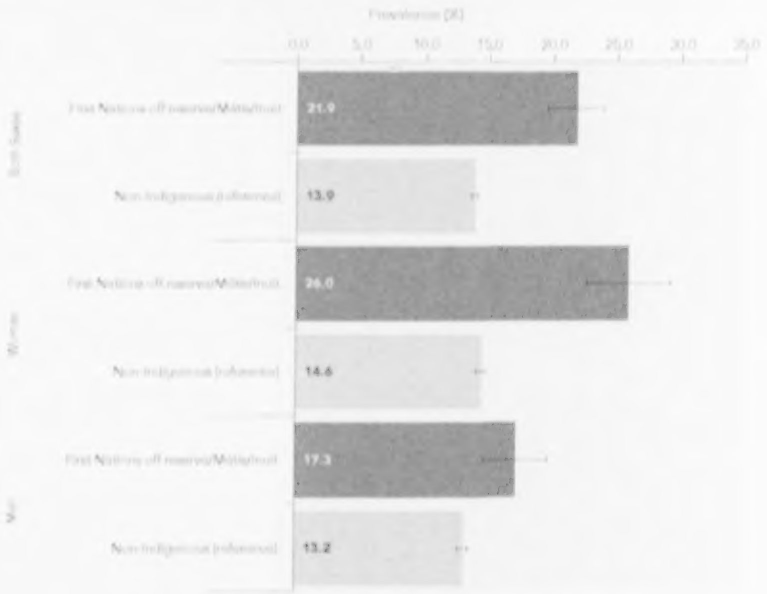
Indigenous adults (excluding First Nations living on reserve and in northern communities; see Box 1) reported a disability prevalence of 21.9%. This was 1.6 (95% CI: 1.4–1.7) times the prevalence of disability among non-Indigenous adults. This means there were 8.0 (95% CI: 5.8–10.2) more cases of disability per 100 people among Indigenous adults than non-Indigenous adults (Figure 1).

If the prevalence of disability among Indigenous adults (excluding First Nations living on reserve and in northern communities) was as low as that among non-Indigenous adults, there would be a 36.5% (95% CI: 29.8–43.1%) reduction in prevalence among Indigenous people. This potential reduction would result in 53 570 fewer disability cases in Canada.

The magnitude of inequality in disability was greater among Indigenous women than among Indigenous men (excluding First Nations living on reserve and in northern communities). Among Indigenous women, the prevalence of disability was 1.8 (95% CI: 1.6–2.0) times compared with non-Indigenous women; among Indigenous men, the prevalence was 1.3 (95% CI: 1.1–1.5) times that of non-Indigenous men.

FIGURE 1

Disability by Indigenous Identity and Sex/Gender, Canada, ages 15+ years, 2012



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
First Nations off reserve/ Métis/Inuit	1.6*	8.0*	36.5*	1.4*	0.2*	53 570*
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
First Nations off reserve/ Métis/Inuit	1.8*	11.5*	44.0*	2.0*	0.3*	41 090*
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
First Nations off reserve/ Métis/Inuit	1.3*	4.1*	23.6*	0.7*	0.1*	12 650*
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Survey on Disability (CSD) 2012

BOX 1
DISABILITY DATA FOR FIRST NATIONS LIVING ON RESERVE AND IN NORTHERN COMMUNITIES

Prepared by the First Nations Information Governance Centre

Information on disability among First Nations living on reserve and in northern communities is collected by the First Nations Information Governance Centre and its regional partners through the First Nations Regional Health Survey (RHS). In the RHS, respondents who were 18 years and older were asked whether they were limited in the kind or amount of activity performed at home, at work, or otherwise because of a physical or mental condition, or a health problem. Due to differences in survey questions and sampling frames, results from the RHS and CSD are not comparable.

Overall, 32.5% (95% CI: 31.0–33.9%) of RHS respondents 18 years and older reported being limited in the kind or amount of activity performed at home, at work, or otherwise because of a physical or mental condition or a health problem. Although not statistically significant, the rate among First Nations women living on reserve appears higher than among men, at 34.2% (95% CI: 32.2–36.2%]) vs. 30.6% (95% CI: 28.8–32.3%).

As with the CSD, the RHS adopts a holistic social model of disability, recognizing that disability arises from complex interactions between people and their environments. Nevertheless, due to differences in sampling frames and wording of survey questions, results from the RHS are not comparable to those from the CSD.

Immigrant Status

The prevalence of disability among non-immigrant adults was 14.6% (95% CI: 14.3–14.9%) whereas that among immigrant adults was 12.7% (95% CI: 12.0–13.3%). In other words, disability prevalence among immigrant adults was 0.9 (95% CI: 0.7-1.0) times that of immigrant adults (Figure 2).

At 10.9% (95% CI: 10.0-11.8), the disability prevalence among immigrant men was 0.8 (95% CI: 0.7–0.8) times that of non-immigrant men (14.2%; 95% CI: 13.7–14.7%). There were, however, no significant differences in inequalities in disability prevalence between immigrant and non-immigrant women.

Income

The relationship between prevalence of disability and income was inverse: as income increased, disability rates decreased. Prevalence of disability among adults in the lowest income quintile was 19.8% (95% CI: 18.9–20.7%). This was 1.9 (95% CI: 1.7–2.0) times the prevalence of disability among adults in the highest income quintile (10.7%; 95% CI: 9.9–11.4%) (Figure 3).

If adults in the lowest income quintile had the same prevalence of disability as adults in the highest income quintile, there would be a 46.2% (95% CI: 41.5–50.8%) reduction in reported disability in the lowest income group. This would potentially reduce the national prevalence of disability by 14.7% (95% CI: 12.6–16.7%), resulting in 553 320 (95% CI: 476 570–630 070) fewer cases of disability in Canada.

Education (ages 20+ years)

The relationship between disability prevalence and education was similar to that for income, with prevalence decreasing as the level of education increased. Among adults with less than a high school education, the disability prevalence was 2.2 (95% CI: 2.0–2.5) times that of adults with the highest level of education (Figure 4).

If adults with less than high school education had the same prevalence of disability as university graduates, there would be a 55.5% (95% CI: 51.2–59.8%) reduction in disability among those with less than a high school education. This would result in a 15.3% (95% CI: 13.6–17.1%) reduction in disability prevalence, which would correspond to 565 460 (95% CI: 500 150–630 780) fewer cases of disability in Canada.

If Canadians who had not completed high school had the same disability prevalence as university graduates, there would be a 55.5% reduction in this group's prevalence of disability (from 20.3% to 9.0%).

Employment Status and Occupation (ages 15–64 years)

Adults not in the labour force (i.e. were neither employed nor unemployed) had a prevalence of disability of 19.9% (95% CI: 19.1–20.7%). This was 3.2 (95% CI: 3.0–3.4) times that of adults who were employed, at 6.2% (95% CI: 5.9–6.5%) (Figure 5).

If adults not in the labour force had the same prevalence of disability as employed adults, there would be a 68.8% (95% CI: 66.6–71.0%) reduction in disability among those not in the labour force. This would potentially reduce disability nationally by 29.6% (95% CI: 27.5–31.8%), resulting in 693 150 (95% CI: 641 470–744 840) fewer cases of disability in Canada.

At 11.6% (95% CI: 9.9-13.3%), the prevalence of disability among those who were unemployed but still in the labour force was 1.9 times that of currently employed Canadians.

Women who were not in the labour force had a disability prevalence 2.7 (95% CI: 2.5–2.9) times that of employed women. In comparison, men not in the labour force had a disability prevalence 4.1 (95% CI: 3.6–4.5) times that of employed men.

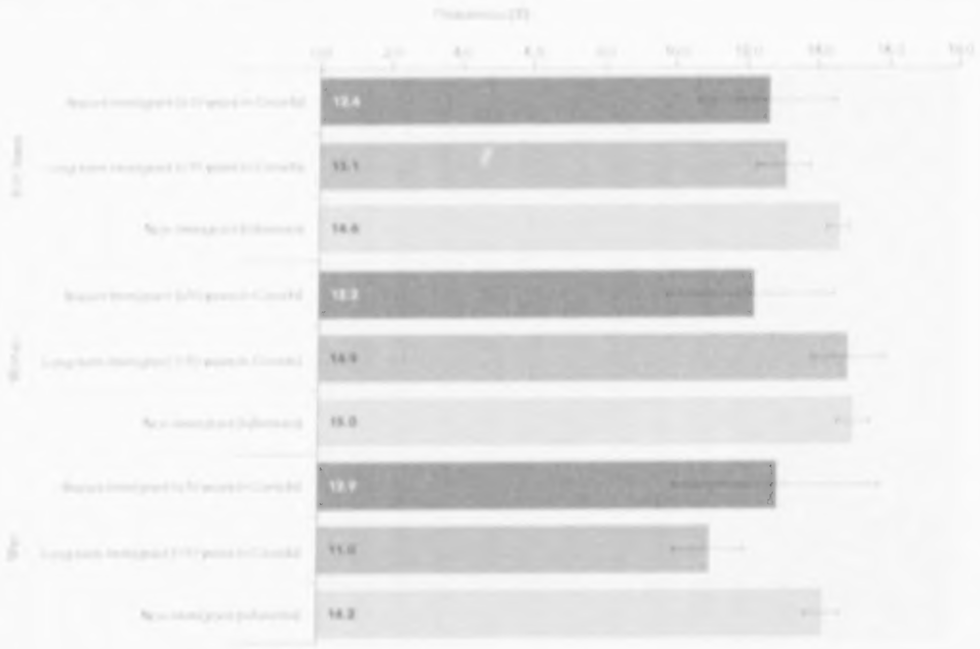
Significant inequalities were also observed between occupational categories. Adults working in unskilled occupations had a disability prevalence of 11.2% (95% CI: 9.9–12.6%). This was 2.1 (95% CI: 1.7–2.4) times the prevalence among adults in professional occupations (5.4%; 95% CI: 4.8-6.0). If the prevalence for those in unskilled occupations was the same as for those in professional occupations, there would be a 52.2% (95% CI: 44.2–60.1%) reduction in the disability prevalence among adults in unskilled occupations. This would potentially reduce disability prevalence nationally by 4.9% (95% CI: 3.6–6.2%) and result in 114 740 (95% CI: 83 930–145 540) fewer cases of disability in Canada.

Rural/Urban Residence (ages 15+ years)

Those living in Toronto, Montréal, or Vancouver had a disability prevalence of 12.2% (95% CI: 11.6–12.7%). This was 0.8 (95% CI: 0.7–0.8) times that of adults in other large urban centres, where the prevalence of disability was 15.5% (95% CI: 15.0–15.9%).

FIGURE 2

Disability by Immigrant Status, Canada, ages 15+ years, 2012

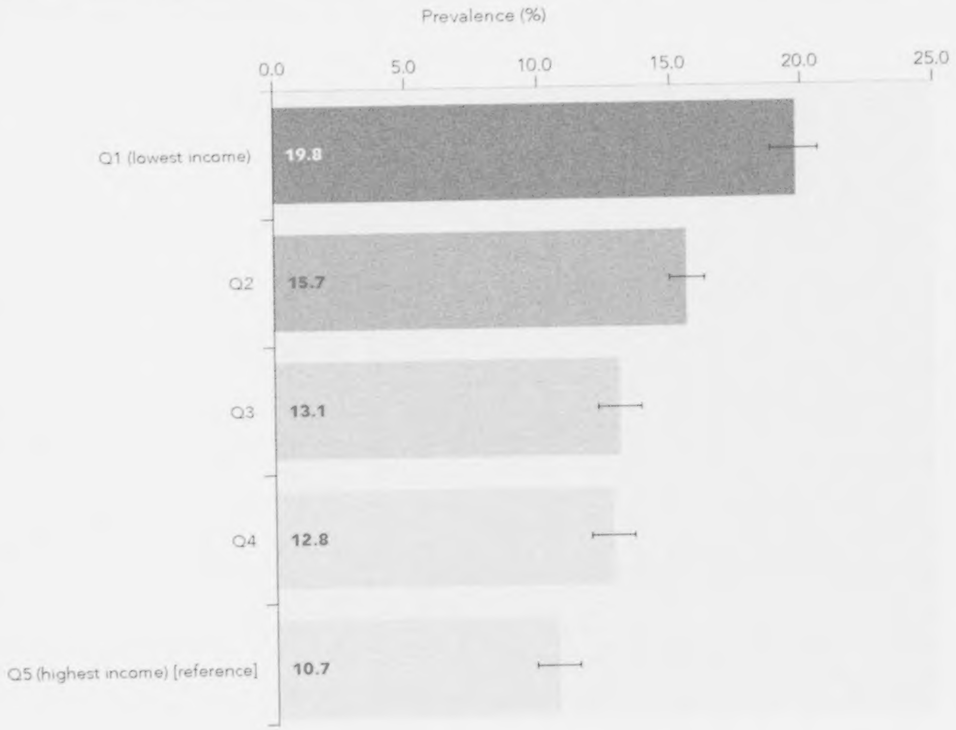


BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Recent Immigrant (≤10 years in Canada)	0.9	−2.0*	NA	NA	NA	NA
Long-term Immigrant (>10 years in Canada)	0.9	−1.5*	NA	NA	NA	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Recent Immigrant (≤10 years in Canada)	0.8	−2.9*	NA	NA	NA	NA
Long-term Immigrant (>10 years in Canada)	1.0	−0.1	NA	NA	0.0	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Recent Immigrant (≤10 years in Canada)	0.9	−1.3	NA	NA	NA	NA
Long-term Immigrant (>10 years in Canada)	0.8*	−3.2*	NA	NA	NA	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Survey on Disability (CSD) 2012

FIGURE 3

Disability by Income Quintile, Canada, ages 15+ years, 2012

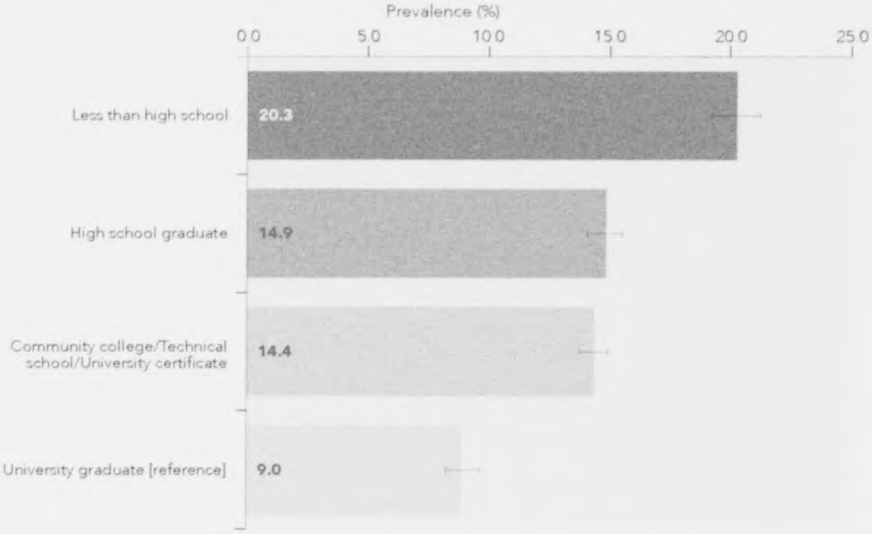


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Q1 (lowest income)	1.9*	9.1*	46.2*	14.7*	2.0*	553 320*
Q2	1.5*	5.1*	32.3*	7.8*	1.1*	294 650*
Q3	1.2*	2.4*	18.3*	3.2*	0.4*	121 450*
Q4	1.2*	2.1*	16.7*	2.6*	0.4*	98 180*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Survey on Disability (CSD) 2012

FIGURE 4

Disability by Education Level, Canada, ages 20+ years, 2012

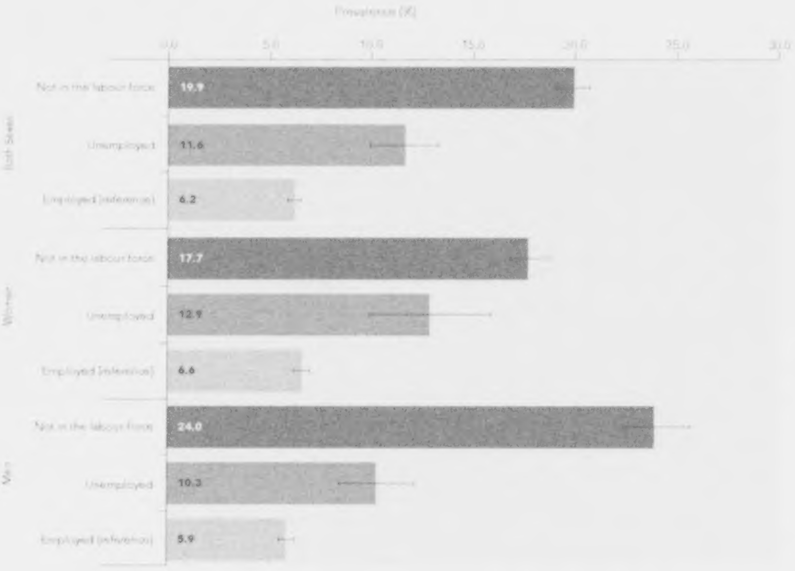


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Less than high school	2.2*	11.3*	55.5*	15.3*	2.2*	565 460*
High school graduate	1.6*	5.9*	39.4*	9.6*	1.4*	354 950*
Community college/ Technical school/ University certificate	1.6*	5.4*	37.2*	12.0*	1.7*	443 300*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Survey on Disability (CSD) 2012

FIGURE 5

Disability by Employment Status and Sex/Gender, Canada, ages 15–64 years, 2012

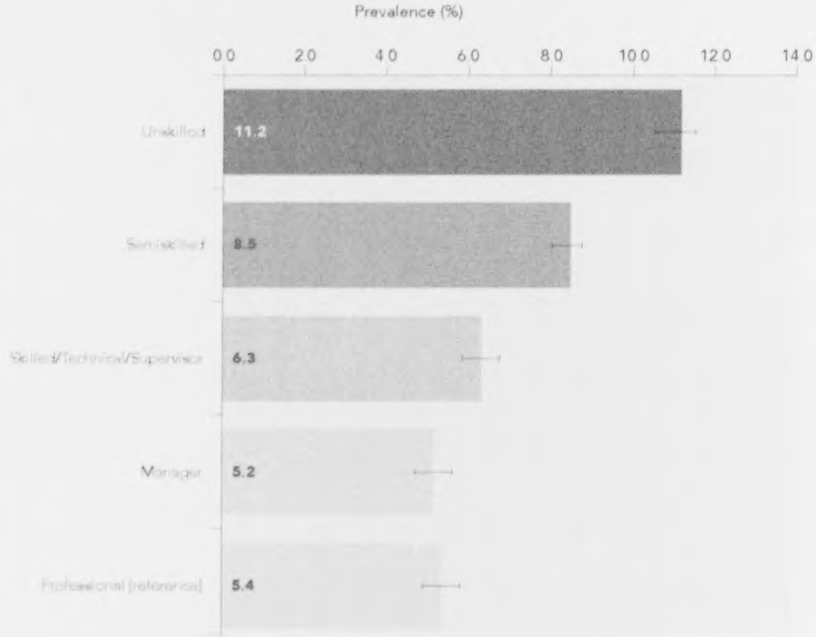


BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Not in the labour force	3.2*	13.7*	68.8*	29.6*	3.0*	693 150*
Unemployed	1.9*	5.4*	46.4*	2.7*	0.3*	63 800*
Employed [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Not in the labour force	2.7*	11.2*	62.9*	28.2*	3.0*	349 610*
Unemployed	2.0*	6.3*	48.9*	2.9*	0.3*	35 880*
Employed [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Not in the labour force	4.1*	18.2*	75.6*	31.1*	2.9*	341 270*
Unemployed	1.8*	4.4*	43.1*	2.5*	0.2*	27 640*
Employed [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Survey on Disability (CSD) 2012

FIGURE 6

Disability by Occupation, Canada, ages 15–64 years, 2012

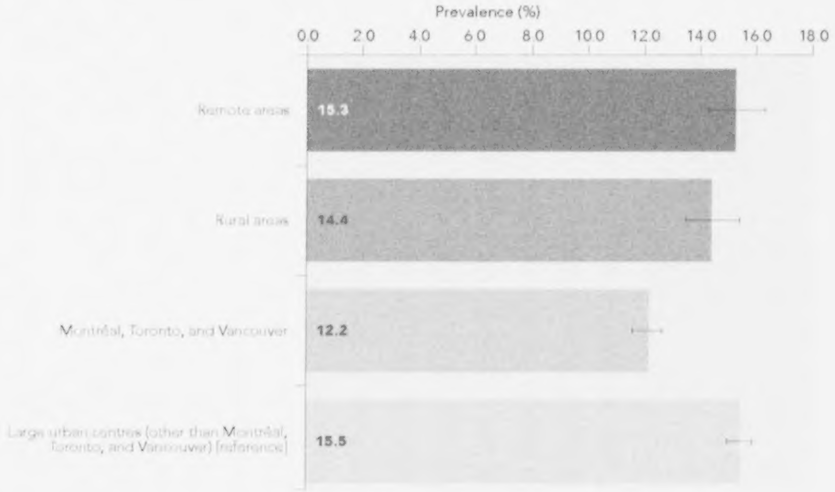


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Unskilled	2.1*	5.9*	52.2*	4.9*	0.5*	114 740*
Semiskilled	1.6*	3.1*	36.5*	7.2*	0.7*	168 150*
Skilled/Technical/Supervisor	1.2	0.9*	14.9*	2.5*	0.3	58 810*
Manager	1.0	–0.1	NA	NA	0.0	NA
Professional [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Survey on Disability (CSD) 2012

FIGURE 7

Disability by Rural/Urban Residence, Canada, ages 15+ years, 2012



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Remote areas	1.0	−0.1	NA	NA	NA	NA
Rural areas	0.9	−1.0	NA	NA	NA	NA
Montréal, Toronto, and Vancouver	0.8*	−3.3*	NA	NA	NA	NA
Large urban centres (other than Montréal, Toronto, and Vancouver) [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Survey on Disability (CSD) 2012

DATA GAPS/LIMITATIONS

The CSD sample is drawn from respondents to the National Household Survey (NHS) who reported limitations in their daily activities because of an impairment, physical or mental condition, or health problem. These NHS filter questions tend to exclude people with very mild disabilities of any type and those with non-physical disabilities (19). Consequently, the CSD may overlook people living with disability who did not associate these questions with their own activity limitations. In addition, the CSD excludes individuals living in institutions who are most likely to have severe disabilities. Disability data collected in the CSD were not stratified according to sexual orientation, cultural/racial background, or material or social deprivation.

Because data from the CSD are cross-sectional, it is not possible to infer causality. As such, our findings are not intended to assess the strength or direction of a relationship between the social stratifiers and disability. Rather, they quantify the extent of inequalities in disability for different socially stratified groups at a given point in time. Other studies, however, have found that the disproportionate burden of disability experienced by these groups is driven by a complex system of social and structural drivers of health (20).

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (21), calculating *p*-values would confirm statistically significant differences.

These findings do not capture the heterogeneous nature of the stratifier groups. Inequalities associated with multiple and intersecting identities are also not captured in this analysis. For example, the use of an aggregated "visible minority" grouping in lieu of separate cultural/racial background groupings or the inability of the current dataset to subcategorize immigrants by country of origin may obscure potential inequalities in disability that distinct and non-homogeneous population groups experience (22,23). These limitations point to key data gaps and highlight the potential for further strengthening the collection of data on people with disability in Canada.

DISCUSSION

Disability is strongly linked to the well-being and health status of families and individuals. Inequalities in disability are prevalent across a range of social stratifications, including employment status, occupation, income, education, and Indigenous identity.

In Canada, Indigenous peoples had a significantly higher prevalence of disability than non-Indigenous people (Box 2). Inequalities between Indigenous and non-Indigenous groups were higher among women than among men. Injuries, as well as many chronic conditions that tend to lead to disability, are also more prevalent among Indigenous groups (24). While First Nations females are disproportionately affected by these risk factors for disability when compared with First Nations males, this trend is also consistent with trends found on national and global scales for non-Indigenous females (25-28).

The prevalence of disability was lower among immigrants than among non-immigrants. In addition, immigrants who had lived in Canada for less than 10 years had a lower prevalence of disability than those who had lived in Canada for over 10 years, and an even lower prevalence than non-immigrants (37). The better health status of immigrants upon arrival in a country compared with the health status of the locally born population—known as the "healthy immigrant effect"—is attributed to self-selection and to the way in which countries, including Canada, select migrants based on health and factors such as education that predict future health (38).

Inequalities in disability in Canada were especially apparent between socioeconomic groups. This is consistent with other research that found a strong association between disability and socioeconomic status (39,40). Those living in the lowest income quintiles had a prevalence of disability almost twice that of those living the highest income quintile; a similar socioeconomic gradient was observed by level of education. Similarly, the prevalence of disability was over 3 times higher for those not in the labour force than

BOX 2

FOCUS ON FIRST NATIONS PEOPLE LIVING ON RESERVE AND IN NORTHERN COMMUNITIES–CONTEXTUALIZING RESULTS FROM THE FIRST NATIONS REGIONAL HEALTH SURVEY

Prepared by the First Nations Information Governance Centre

While rates of disability for First Nations people appear high, these rates vary widely across communities, and may be caused by multiple and inter-related factors. The remote and/or rural nature of some communities can create financial and geographic barriers for accessing health care that could otherwise aid in treating ailments (e.g. diabetes) that may lead to disability (e.g. vision loss or limb amputations) (29). Barriers to economic development in many of these communities have an impact on educational attainment, employment, and living conditions (e.g. increased rates of overcrowding, housing in need of repairs). These outcomes undermine well-being and increase susceptibility to negative health outcomes, such as injuries (e.g. from accidents, suicide attempts) and chronic conditions (e.g. arthritis, diabetes), which can result in disability (1,30-34). Risk factors for disability are often exacerbated for First Nations people due to the transgenerational effects of colonization on the environmental, psychosocial, and health conditions of communities (34,35). For example, the dominant Westernized mode of health care service delivery can lead to conflict with First Nations values, as well as stigmatization and systemic racism, further inhibiting access to appropriate treatment options in First Nations communities (36).

for employed people, and almost 2 times higher for those who were unemployed and looking for work. While impairments can, in some cases, limit an individual's ability to work, for many people with disabilities, the challenge lies in physical and attitudinal barriers that prevent them from integrating into the workplace, an important marker of self-sufficiency and social and economic inclusion. From a labour market perspective, people with disabilities represent a sizable talent pool that remains underutilized by employers (41,42).

As the social model of disability describes, disability is not an individual deficit but rather the result of disabling social conditions that disadvantage and exclude people with impairments. Inequalities in disability exist across a range of social stratifications, including employment status, occupation, area of residence, immigrant status, and Indigenous identity. There is also a clear socioeconomic gradient in disability, with rates increasing as incomes and education levels decrease. The disproportionate levels of disability experienced by certain groups are driven by a complex system of social and structural drivers of health (20). When disability intersects with other sociodemographic identifiers, such as sexual orientation or cultural/racial status, additional and unique barriers may arise that compound inequalities for subpopulations living with disabilities.

Policy interventions, programs, and research are required to impact the broader, intersectoral influences of disabling social conditions, such as access to education and employment (9), that disadvantage and exclude people with impairments and create these inequalities. The systematic and ongoing monitoring and measurement of health inequalities experienced by adults living with disability across social stratifiers will help to inform and strengthen interventions to reduce the revealed differences and track how these inequalities change over time.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Disability. Data Source: CSD 2012

					SUMMARY MEASURES									POPULATION IMPACT MEASURES							
Social Stratifiers		Age-Standardized Prevalence (%)			Rate Ratio (RR)			Rate Difference (RD) per 100			Attributable Fraction (AF%)			Population Attributable Fraction (PAF%)			Population Attributable Rate (PAR) per 100			Population Impact Number (PIN)		
		Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males
Overall	Both Sexes	14.2	14.9	13.3	NA									NA								
Population groups																				
Sex/gender	Females	14.9	NA		NA	1.1 *	NA	NA	1.6 *	NA	NA	10.6 *	NA	NA	5.8 *	NA	NA	0.8 *		NA	219,460 *	NA
	Males (reference)	13.3			Reference																	
Indigenous identity	First Nations off reserve/Inuit/Métis	21.9	26.0	17.3	1.6 *	1.8 *	1.3 *	8.0 *	11.5 *	4.1 *	36.5 *	44.0 *	23.6 *	1.4 *	2.0 *	0.7 *	0.2 *	0.3 *	0.1	53,570 *	41,090 *	12,650 *
	Non-Indigenous (reference)	13.9	14.6	13.2	Reference																	
Cultural/racial background	Visible minority	13.4	14.7	11.5	0.9	1.0	0.8	−0.8	−0.1	−2.1 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Non-visible minority (reference)	14.2	14.8	13.6	Reference																	
Immigrant status	Recent	12.6	12.2	12.9	0.9	0.8	0.9	−2.0 *	−2.9 *	−1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Long-term	13.1	14.9	11.0	0.9	1.0	0.8 *	−1.5 *	−0.1	−3.2 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Non-immigrant (reference)	14.6	15.0	14.2	Reference																	
Immigrant status (collapsed)	Immigrant	12.7	14.2	10.9	0.9 *	0.9	0.8 *	1.9 *	0.8	3.3 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Non-immigrant (reference)	14.6	15.0	14.2	Reference																	
Rural/urban residence	Remote areas	15.3	15.8	15.0	1.0	1.0	1.0	−0.1	−0.7	0.5	NA	NA	3.4	NA	NA	0.2	0.0	0.0	0.0	NA	NA	3,930
	Small urban centres	14.4	14.2	14.7	0.9	0.9	1.0	−1.0	−2.2 *	0.2	NA	NA	1.5	NA	NA	0.2	NA	NA	0.0	NA	NA	3,750
	Toronto, Montréal, and Vancouver	12.2	13.2	10.9	0.8 *	0.8 *	0.8 *	−3.3 *	−3.3 *	−3.5 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Large urban centres other than Toronto, Montréal and Vancouver (reference)	15.5	16.5	14.4	Reference																	
Socioeconomic determinants of health																				
Income quintile	Q1 (lowest income)	19.8	20.6	18.8	1.9 *	1.7 *	2.1 *	9.1 *	8.5 *	9.8 *	46.2 *	41.4 *	52.2 *	14.7 *	14.4 *	14.6 *	2.0 *	2.1 *	1.8 *	553,320 *	299,510 *	248,400 *
	Q2	15.7	16.0	15.4	1.5 *	1.3 *	1.7 *	5.1 *	4.0 *	6.4 *	32.3 *	24.9 *	41.7 *	7.8 *	5.6 *	11.0 *	1.1 *	0.8 *	1.4 *	294,650 *	116,270 *	186,320 *
	Q3	13.1	13.7	12.5	1.2 *	1.1	1.4 *	2.4 *	1.6 *	3.5 *	18.3 *	11.9 *	27.9 *	3.2 *	2.0 *	5.2 *	0.4 *	0.3	0.7 *	121,450 *	41,000 *	88,500 *
	Q4	12.8	13.9	11.6	1.2 *	1.2	1.3 *	2.1 *	1.9 *	2.6 *	16.7 *	13.4 *	22.6 *	2.6 *	2.0 *	3.7 *	0.4 *	0.3	0.5 *	98,180 *	41,350 *	62,970 *
	Q5 (highest income) (reference)	10.7	12.0	9.0	Reference																	
Education (aged 20+)	Less than high school	20.3	22.6	18.1	2.2 *	2.3 *	1.7 *	11.3 *	12.9 *	5.8 *	55.5 *	34.2 *	40.8 *	15.3 *	17.1 *	13.3 *	2.2 *	2.7 *	1.8 *	565,460 *	348,760 *	220,310 *
	High school graduate	14.9	15.8	13.7	1.6 *	1.6 *	1.6 *	5.9 *	6.1 *	5.4 *	39.4 *	38.8 *	39.2 *	9.6 *	10.3 *	8.6 *	1.4 *	1.6 *	1.1 *	354,950 *	209,530 *	141,800 *
	Community college/ Technical school/ University certificate	14.4	14.7	14.4	1.6 *	1.5 *	1.7 *	5.4 *	5.0 *	9.7 *	37.2 *	57.3 *	40.8 *	12.0 *	10.0 *	14.8 *	1.7 *	1.6 *	2.0 *	443,300 *	203,040 *	243,920 *
	University graduate (reference)	9.0	9.6	8.4	Reference																	
Employment status (aged 18-75)	Not in labour force	19.9	17.7	24.0	3.2 *	2.7 *	4.1 *	13.70 *	11.20 *	18.2 *	68.8 *	62.9 *	75.6 *	29.6 *	28.2 *	31.1 *	3.0 *	3.0 *	2.9 *	693,150 *	349,610 *	341,270 *
	Unemployed	11.6	12.9	10.3	1.9 *	2.0 *	1.8 *	5.40 *	6.30 *	4.4 *	46.4 *	48.9 *	43.1 *	2.7 *	2.9 *	2.5 *	0.3 *	0.3 *	0.2 *	63,800 *	35,880 *	27,640 *
	Employed (reference)	6.2	6.6	5.9	Reference																	
Occupation (aged 15-64)	Unskilled	11.2	11.6	10.9	2.1 *	2.1 *	2.1 *	5.9 *	6.1 *	5.8 *	52.2 *	52.4 *	53.1 *	4.9 *	4.5 *	5.4 *	0.5 *	0.5 *	0.5 *	114,740 *	56,360 *	59,660 *
	Semiskilled	8.5	9.0	7.8	1.6 *	1.6 *	1.5 *	3.1 *	3.5 *	2.7 *	36.5 *	39.0 *	34.3 *	7.2 *	6.1 *	6.1 *	0.7 *	0.9 *	0.6 *	168,150 *	10,413 *	66,510 *
	Skilled/Technical/ Supervisor	6.3	6.7	6.1	1.2	1.2	1.2	0.9 *	1.2 *	0.9	14.9 *	18.0 *	15.4	2.5 *	3.3	3.3	0.3	0.3	NA	58,810 *	29,000 *	36,100
	Manager	5.2	6.4	4.4	1.0	1.2	0.9	−0.1	0.9	−0.7	NA	13.9 *	NA	NA	0.6	NA	0.0	0.1	0.3	NA	7,960	NA
	Professional (reference)	5.4	5.5	5.1	Reference																	

NOTE:

The purpose of the colour scaling is to map (for all indicators and stratifiers): 1- the relative and absolute inequalities; 2- the patterns of inequalities (e.g. Indigenous populations frequently experience inequalities compared to non-Indigenous); 3- the gradients of inequalities (e.g. there are frequently inequalities in a gradient across income strata). The magnitude and distribution of inequalities shown in this table should be interpreted with caution, taking into consideration one indicator at time, the differences among the data sources used (e.g. survey vs. administrative register), and existing limitations in the measurement of the social stratifiers.

Colour scaling for rate ratios below 1 and rate differences below 0 was applied using the reciprocal value and the absolute value respectively. For example, for a RR of 0.5, the colour scale applied is for the value 2.0 (1/0.5) and for a RD of -10, the colour scale for the value 10 is used. Colour scaling is only applied when the difference between the value and the reference group is statistically significant.

LEGEND

Non-applicable	NA
Non-reportable	F
Report with Caution	E
Statistically Significant	*
Reference	▨

RR	RD per 100	
≥ 2.0	≥ 15.2	Larger inequality
1.7 → 2.0	10.5 → 15.2	
1.5 → 1.7	7.9 → 10.5	
1.4 → 1.5	5.8 → 7.9	
1.3 → 1.4	4.4 → 5.8	
1.0 → 1.3	0.0 → 4.4	Smaller inequality

References

(1) Statistics Canada. [Internet]. Ottawa: Statistics Canada; 2013. Disability in Canada: Initial findings from the Canadian Survey on Disability [updated 2015 Nov 30; cited 2017 Mar 27]; [about 2 screens]. Available from: http://www.statcan.gc.ca/pub/89-654-x/89-654-x2013002-eng.htm.

(2) Berghs MJ, Atkin KM, Graham HM, Hatton C, Thomas C. Implications for public health research of models and theories of disability: a scoping study and evidence synthesis. 2016.

(3) McDermott S, Turk MA. The myth and reality of disability prevalence: measuring disability for research and service. Disability and Health Journal. 2011;4(1):1-5.

(4) Shakespeare T. The social model of disability. The disability studies reader. 2006;2:197-204.

(5) Barnes C. Understanding the social model of disability. Routledge handbook of disability studies.Oxon and New York: Routledge. 2012.

(6) MacKenzie Andrew, Hurst Matt and Crompton Susan. [Internet]. Statistics Canada; 11 December, 2009. Living with disability series:Defining disability in the Participation and Activity Limitation Survey [updated 2009 11 December, 2009; cited 15 November, 2017]; Available from: http://www.statcan.gc.ca/pub/11-008-x/2009002/article/11024-eng.htm.

(7) United Nations. [Internet]. United Nations; Convention on the rights of persons with disabilities and optional protocol [updated 2008 27 March 2008; cited 15 November, 2017]; Available from: https://www.un.org/development/desa/disabilities/human-rights-council-resolution-79-human-rights-of-persons-with-disabilities.html.

(8) Adelson N. The embodiment of inequity: Health disparities in Aboriginal Canada. Canadian Journal of Public Health. 2005;96(2):S45.

(9) Canadian Human Rights Commission. Report on equality rights of people with disabilities. 2012 [cited 15 November, 2017].

(10) Brown CL, Emery J. The impact of disability on earnings and labour force participation in Canada: Evidence from the 2001 PALS and from Canadian case law. J.Legal Econ. 2009;16:19.

(11) Canadian association for Community Living. Assuring income security and equality for Canadians with intellectual disabilities and their families. CACL; 2013 [cited 15 November, 2017].

(12) Council of Canadians with Disabilities. [Internet]. Social policy [updated 2013 cited 15 November, 2017]; Available from: http://www.ccdonline.ca/en/socialpolicy/.

(13) Turcotte M. Persons with disabilities and employment. Statistics Canada; 2014 [cited 15 November, 2017].

(14) Sienstra D. Race/ethnicity and disability studies: towards an explicitly intersectional approach. In: N Watson N, A Roulstone, C Thomas, editor. *Routledge Handbook of Disability Studies*: London: Routledge; 2012. p. 376.

(15) Warner DF, Brown TH. Understanding how race/ethnicity and gender define age-trajectories of disability: an intersectional approach. Social Science and Medicine. 2011;72(8): 1236-1248.

(16) National Household Survey. 2011 National Household Survey Public Use Microdata File (PUMF). 2011.

(17) Statistics Canada. Canadian Survey on Disability, 2012: Concepts and methods guide. Statistics Canada; 2014 [cited 15 November, 2017].

(18) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(19) Grondin C. A new survey measure of disability: The Disability Screening Questions (DSQ). Statistics Canada; 2016 [cited 15 November, 2017].

(20) Emerson E, Madden R, Graham H, Llewellyn G, Hatton C, Robertson J. The health of disabled people and the social determinants of health. Public Health. 2011 201103;125(3):145-7.

(21) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(22) Chen J, Ng E, Wilkins R. The health of Canada's immigrants in 1994-95. Health rep. 1996 Spring;7 Cat. no. 82-003(4):33-46.

(23) Edwards C, Fillingim R, Keefe F. Race, ethnicity and pain. Pain. 2001 Nov;94(2):133-7.

(24) Statistics Canada. [Internet]. 2014. Canadian Survey on Disability, 2012: Concepts and Methods Guide. Statistics Canada Catalogue no. 89-654-X. Ottawa. Version updated November 2015 Available from: http://www.statcan.gc.ca/pub/89-654-x/89-654-x2014001-eng.htm.

(25) Dyck R, Osgood N, Lin TH, Gao A, Stang MR. Epidemiology of diabetes mellitus among First Nations and non-First Nations adults. CMAJ. 2010 Feb 23;182(3):249-56.

(26) Guedes A, Bott S, Garcia-Moreno C, Colombini M. Bridging the gaps: a global review of intersections of violence against women and violence against children. Global health action. 2016;9(1):31516.

(27) King M. Chronic diseases and mortality in Canadian Aboriginal peoples: learning from the knowledge. Chronic Dis Can. 2010 Dec;31(1):2-3.

(28) Statistics Canada. [Internet]. Ottawa: Statistics Canada; 2016. Victimization of Aboriginal peoples in Canada. Catalogue no. 85-002-X [updated 2016 Jun 28; cited 2017 Mar 23]; [about 24 screens]. Available from: http://www.statcan.gc.ca/pub/85-002-x/2016001/article/14631-eng.htm.

(29) National Coalition for Vision Health. [Internet]. Vision Loss in Canada 2011 cited 16 November, 2017]; [about 4 screens]. Available from: http://www.cos-sco.ca/wp-content/uploads/2012/09/VisionLossinCanada_e.pdf.

(30) Canadian Institute for Health Research. How healthy Are rural Canadians? An assessment of their health status and health determinants. Ottawa: Canadian Institute for Health Research; 2006 [cited 15 November, 2017].

(31) Oliver LN, Finès P, Bougie E, Kohen D. Intentional injury hospitalizations in geographical areas with a high percentage of Aboriginal-identity residents, 2004/2005 to 2009/2010. Chronic Diseases and Injuries in Canada. 2014;34(2-3):82-93.

(32) Pike I, McDonald R, Piedt S, Macpherson AK. Developing injury indicators for First Nations and Inuit children and youth in Canada: a modified Delphi approach. Chronic diseases and injuries in Canada. 2014;34(4).

(33) Statistics Canada. [Internet]. Statistics Canada; Table 15 Prevalence of selected chronic conditions diagnosed by health professional for female population aged 15 and over, by selected Aboriginal identity group, Canada, 2012 [updated 2016 23 February, 2016; cited 16 November, 2017]; [about 1 screens]. Available from: http://www.statcan.gc.ca/pub/89-503-x/2015001/article/14313/tbl/tbl15-eng.htm.

(34) Statistics Canada. Aboriginal statistics at a glance: 2nd edition [Internet]. Statistics Canada; 2015 [cited 15 November, 2017]. Available from: http://www.statcan.gc.ca/pub/89-645-x/89-645-x2015001-eng.pdf.

(35) Statistics Canada. [Internet]. 2016. Is the injury gap closing between the Aboriginal and general populations of British Columbia? Statistics Canada Catalogue no. 82-003-X. Ottawa. Version updated November 2015. Available from: http://www.statcan.gc.ca/pub/82-003-x/2015001/article/14131-eng.pdf.

(36) Leyland A, Smylie J, Cole M, et al. Health and health care implications of systemic racism on Indigenous peoples in Canada [Internet]. Mississauga: The College of Family Physicians of Canada; 2016 [cited 2017 Sep 29]. Available from: http://www.cfpc.ca/uploadedFiles/Resources/_PDFs/SystemicRacism_ENG.pdf.

(37) Newbold KB, Simone D. Comparing disability amongst immigrants and native-born in Canada. Soc Sci Med. 2015;145:53-62.

(38) Vang Z, Sigouin J, Flenon A, Gagnon A. [Internet]. Population Change and Lifecourse Strategic Knowledge Cluser Discussion Paper Series ;3(1) article 4.; 2015. The healthy immigrant effect in Canada : A systematic reivew Available from: http://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=1012&context=pclc.

(39) Elwan A. [Internet]. Washington, DC: Social Protection Unit, Human Development Network, World Bank; 1999. Poverty and disability: A survey of the literature Available from: http://documents.worldbank.org/curated/en/488521468764667300/pdf/multi-page.pdf.

(40) Minkler M, Fuller-Thomson E, Guralnik JM. Gradient of disability across the socioeconomic spectrum in the United States. N Engl J Med. 2006;355(7):695-703.

(41) Business benefits of accessible workplaces. Ottawa: The Conference Board; 2014.

(42) Library of Parliament. [Internet]. 2013. Persons with disabilities in the Canadian labour market: An overlooked talent pool Available from: https://lop.parl.ca/Content/LOP/ResearchPublications/2013-17-e.pdf.

INEQUALITIES IN
OBESITY IN CANADA

INEQUALITIES HIGHLIGHTS

- The prevalence of obesity among adults who have not completed high school is twice that of those with a university degree. Women with no high school diploma have the greatest inequality: they are 2.2 times more likely to be obese than female university graduates,. This represents 14.1 more cases of obesity per 100 people among women with no high school diploma.
- The prevalence of obesity among First Nations living off reserve and Inuit is 1.6 times that of non-Indigenous people, and represents 11.4 and 10.9 more cases of obesity per 100 people, respectively.
- The prevalence of obesity among people with severe and moderate functional health impairments is, respectively, 1.6 and 1.2 that of those with no impairment. This represents 10.1 and 3.5 more cases of obesity per 100 people.
- Women in the lowest income group have a prevalence of obesity 1.6 times that of women in the highest income group. This represents 7.2 more cases of obesity per 100 people among women in the lowest income group.
- The prevalence of obesity among people who are permanently unable to work is 1.6 times that of people who had a job in the last week. This represents 10.2 more cases of obesity per 100 people.
- Obesity is less prevalent among immigrants than non-immigrants and less prevalent among recent immigrants than among long-term immigrants, at 0.6 and 0.7 times that of non-immigrants. This represents 8.6 and 6.2 fewer cases of obesity per 100 recent and long-term immigrants, respectively, than among non-immigrants.
- The prevalence of obesity among East/Southeast Asian Canadian adults is 0.25 times that of White Canadian adults. This represents 14.6 fewer cases of obesity per 100 people among East/Southeast Asians.

ACRONYM	FULL NAME
BMI	Body Mass Index
CCHS	Canadian Community Health Survey
CI	Confidence Interval
FNIGC	First Nations Information Governance Centre
RHS	First Nations Regional Health Survey

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Obesity, the excessive accumulation of body fat, is associated with a host of health conditions, including type 2 diabetes, asthma, gallbladder disease, arthritis, many cancers (colorectal, breast, kidney, ovarian, endometrial, and pancreatic), and cardiovascular conditions such as hypertension, stroke, coronary artery disease, and congestive heart failure (1). The economic burden of obesity is significant.

A study that examined 18 chronic diseases associated with obesity estimated the cost to the Canadian economy to be $7.1 billion in 2006 (2). In addition, the psychological burden associated with obesity—people living with this condition face discrimination, stereotyping, and stigma—presents a barrier to its effective public health management (3,4).

Based on direct height and weight measurements, obesity rates among Canadian adults have almost doubled over the past several decades, from 13.8% in 1978–1979 to nearly one-quarter (23.1%) in 2004 (5). More recent self-reported height and weight data, adjusted for the tendency of people to over-report height and under-report weight, indicate that almost 1 in 4 adult Canadians (24.8%) were obese in 2011–2012 (6).

Obesity is a result of complex interactions between factors at the individual, environmental, and structural levels (3). At the individual level, obesity is caused by a sustained consumption of too many calories or expenditure of too few calories (7). However, broader economic and social drivers cause obesity at the population level. These drivers include policies and economies that support consumption-based growth, which leads to increased availability and accessibility of inexpensive, caloric, and highly processed foods, and pervasive food marketing (8). Factors at the environmental and individual levels moderate the relationship between these drivers and obesity. These factors include built environments that promote and enable physical activity; social, gender, and cultural norms related to food choices, physical activity, and body size; and lack of sleep (8-11). Interactions between these factors can lead to the unequal distribution of obesity in the population.

Obesity was selected as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter).

METHODS

The prevalence of obesity in Canada was calculated using self-reported height and weight data from the Canadian Community Health Survey (CCHS) collected between 2010 and 2013. Obesity is defined as a body mass index (BMI; calculated by dividing an individual's weight in kilograms by their height in metres, squared) of 30.0 kg/m^2 or higher.

The analysis was limited to CCHS respondents aged 18 years and over. Inequalities in obesity prevalence were assessed by examining differences in obesity according to social stratifiers grouped under socioeconomic and sociodemographic stratifiers collected through the CCHS. Sociodemographic stratifiers include sex/gender, Indigenous identity (First Nations, Inuit, or Métis), cultural/racial background, immigrant status, sexual orientation (ages 18–59 years[33]), functional health, and rural/urban residence. Sociodemographic stratifiers include income, education (ages 20+ years), occupation (ages 18–75 years), and employment status (ages 18–75 years). Prevalence data were age-standardized using the 2011 Canadian Census of Population.

For the Indigenous identity stratifier, the CCHS sampling frame captures information on Indigenous people who identify as Inuit, Métis, and First Nations people living off reserve but excludes First Nations people living on reserves and Inuit in the Quebec region of Nunavik. For First Nations people living on reserve and in northern communities, similar information is collected by the First Nations Information Governance Centre (FNIGC) and its regional partners through the First Nations Regional Health Survey (RHS). This chapter uses RHS data from 2008 to 2010 for respondents aged 18 years and older, age-standardized using the 2011 Census of Population.

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[33] The CCHS does not collect data on sexual orientation from individuals over the age of 59 years.

> Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported along with their 95% confidence intervals (CI). Statistical significance was assessed using 95% confidence intervals (12). Sex/gender-specific inequalities for all of the social stratifiers were also calculated and reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of obesity inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable fraction, population attributable rate, and population impact number. However, due to methodological limitations in combining two datasets (i.e. CCHS and RHS), results for First Nations people living on reserve and in northern communities were not included in the calculation of inequality measures and are reported here in terms of prevalence only.

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups because of social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in Canada. (For more information, see the Methodology chapter.)

FINDINGS

Between 2010 and 2013, 18.2% (95% CI: 18.0–18.5) of Canadians aged 18 years and older were classified as obese, based on their self-reported height and weight. Significant inequalities in obesity prevalence were observed across most of the social strata that were assessed, with the exception of sexual orientation; however, important and differential inequalities were observed by income and sexual orientation when the data were stratified by sex/gender (Table 1). (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Sex/Gender

The prevalence of obesity among men, at 19.4% (95% CI: 19.0–19.8%), was 1.1 (95% CI: 1.1–1.2) times that of women, at 17.0% (95% CI: 16.7–17.4%) (Annex 1).

If men had the same obesity prevalence as women, there would be a 12.3% (95% CI: 9.7–14.9%) reduction in obesity among men and a 6.6% (95% CI: 5.1–8.1%) reduction in the prevalence of obesity in Canada. This would, hypothetically, result in 319 590 (95% CI: 246 660–392 520) fewer cases of obesity in the overall Canadian population.

Indigenous Peoples

Indigenous peoples had a higher prevalence of obesity than non-Indigenous people. The prevalence of obesity among First Nations adults living off reserve was 29.4% (95% CI: 27.1–31.7%); among Métis adults, 25.7% (95% CI: 23.4–28.1%); among Inuit adults, 28.9% (95% CI: 23.0–34.8%); and among non-Indigenous adults, 18.0% (95% CI: 17.7–18.3%). The prevalence of obesity among First Nations adults living off reserve was 1.6 (95%: 1.5–1.8) times that of non-Indigenous people (Figure 1).

If the prevalence of obesity among First Nations adults living off reserve was as low as that of non-Indigenous people, there would be a 38.7% (95% CI: 33.8–43.6) reduction in the prevalence of obesity among First Nations people living off reserve. This would potentially result in 47 050 (95% CI: 37 140–56 960) fewer cases of people with obesity in Canada.

In 2008-2010, the prevalence of obesity among First Nations living on reserve and in northern communities was 38.5% (95% CI: 37.0–40.0)[34]. Although not statistically significant, the prevalence among women appears higher than among men: at 40.1% (95% CI: 38.4–41.9%) versus 36.8% (95% CI: 34.8–38.8%). This apparent trend is opposite to that of the trend in the overall population in Canada.

Cultural/Racial Background

The prevalence of obesity among East/Southeast Asian adults was 0.25 (95% CI: 0.21–0.30) times that of White adults, equivalent to 14.6 fewer reported cases per 100 people. Similarly, a lower prevalence was found among South Asian adults, at 0.57 (95% CI: 0.48–0.65) times that of White adults, and among Arab/West Asian adults, at 0.82 (95% CI: 0.65–0.99) times that of White adults (Figure 2, Annex 1).

Sexual Orientation (ages 18–59 years)

There were no inequalities found in the prevalence of obesity by sexual orientation in the overall population. However, inequalities existed by sexual orientation when assessed in men and women separately. The prevalence of obesity was lower among men who identified as gay, at 0.7 (95% CI: 0.5–0.9) times that of men who identified as heterosexual. This represents 6.3 (95% CI: 2.4–10.3) fewer gay men with obesity per 100 people than heterosexual men (Annex 1).

The prevalence of obesity among women who identified as lesbian was 1.4 (95% CI: 1.1–1.6) times the prevalence of women who identified as heterosexual. This represents 5.9 (95% CI: 1.5–10.3) more lesbian women with obesity per 100 people than heterosexual women (Annex 1).

Functional Health

The prevalence of obesity among people with severe and moderate functional health impairments was 26.3% (95% CI: 24.9–27.6%) and 19.7% (95% CI: 18.7–20.7%), respectively (Figure 3).

If the prevalence of obesity in these population groups was the same as among adults with no impairments, there would be 10.1 (95% CI: 8.5–11.7) fewer cases of obesity per 100 people with severe impairments and 3.5 (95% CI: 2.2–4.9) fewer cases of obesity per 100 people with moderate impairments (Figure 3).

If the prevalence of obesity among people with severe functional impairments was the same as for those with no impairments, there would be a 38.4% (95% CI: 33.7–43.1%) reduction in obesity prevalence among those with severe functional health impairments and a 7.1% (95% CI: 5.9–8.3%) reduction in the overall national obesity prevalence. As a result, there would be 344 960 (95% CI: 288 820–401 090) fewer people with obesity in Canada (Figure 3).

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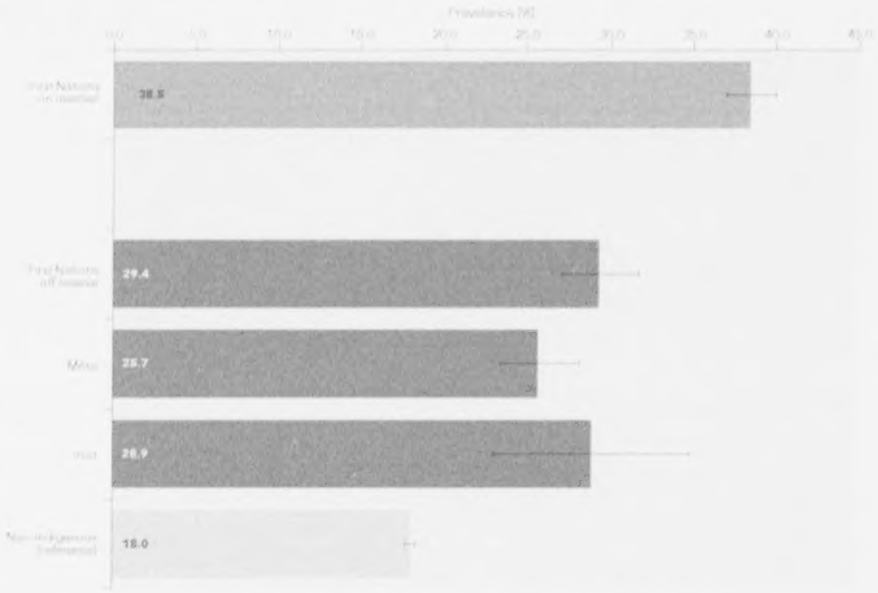
[34] RHS prevalence data are presented alongside CCHS data to approximate the magnitude of inequality between First Nations people living on reserve and in northern communities and the non-Indigenous population. Due to methodological limitations, inequality measures were not calculated for the RHS dataset.

FIGURE 1

Obesity by Indigenous Identity, Canada, ages 18+ years, 2010–2013

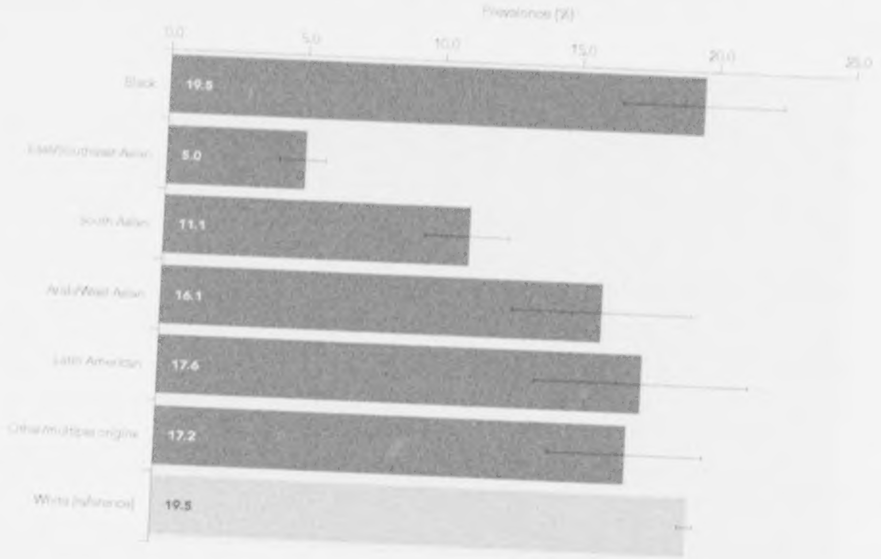


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
First Nations off reserve	1.6*	11.4*	38.7*	1.0*	0.2*	47 050*
Métis	1.4*	7.7*	30.0*	0.6*	0.1*	28 490*
Inuit	1.6*	10.9*	37.7*	0.1*	0.0*	2 870*
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed with the 2011 Census of Population.
Sources: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013;
[1] First Nations Regional Health Survey (RHS) 2008–2010

FIGURE 2

Obesity by Cultural/Racial Background, Canada, ages 18+ years, 2010–2013

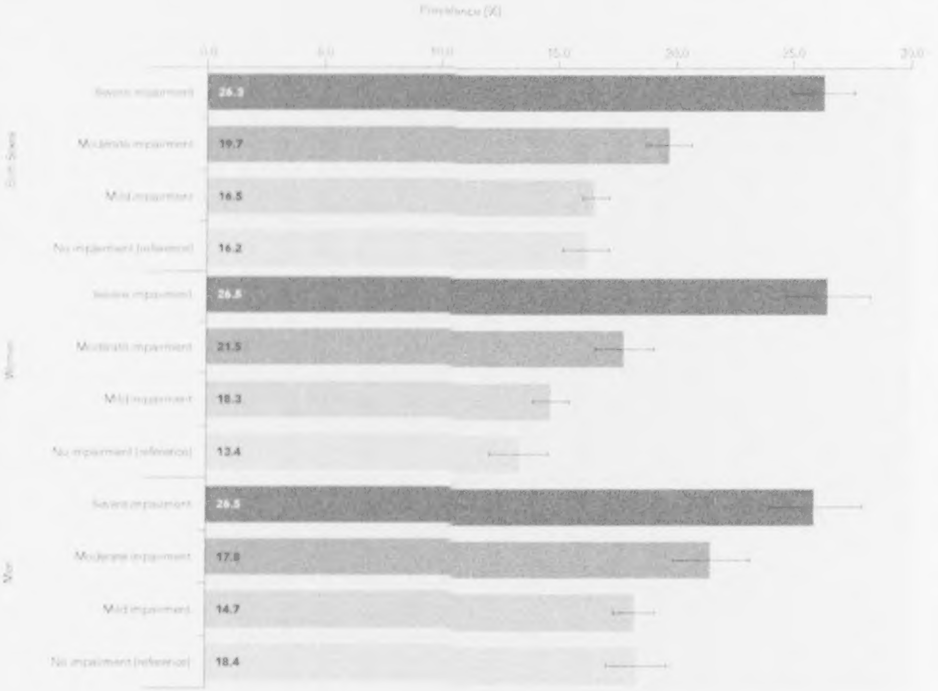


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Black	1.0	-0.1	NA	NA	NA	NA
East/Southeast Asian	0.3*	-14.6*	NA	NA	NA	NA
South Asian	0.6*	-8.4*	NA	NA	NA	NA
Arab/West Asian	0.8*	-3.5*	NA	NA	NA	NA
Latin American	0.9	-1.9	NA	NA	NA	NA
Other/multiple origins	0.9	-2.4	NA	NA	NA	NA
White [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non applicable
*: Significantly different from reference group
Age standardization was performed with the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)-Annual Component 2010-2013

FIGURE 3

Obesity by Functional Health and Sex/Gender, Canada, ages 18+ years, 2010 and 2013



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Severe impairment	1.6*	10.1*	38.4*	7.1*	1.3*	344 960*
Moderate impairment	1.2*	3.5*	17.9*	3.0*	0.6*	147 710*
Mild impairment	1.0	0.4	2.1	0.9	0.2	43 110
No impairment [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Severe impairment	2.0*	13.1*	49.5*	11.2*	1.9*	251 000*
Moderate impairment	1.3*	4.5*	25.2*	4.4*	0.7*	98 410*
Mild impairment	1.1	1.4	9.4	3.9	0.6	86 700
No impairment [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Severe impairment	1.4*	7.6*	29.3*	4.4*	0.9*	115 530*
Moderate impairment	1.2*	3.1*	14.6*	2.4*	0.5*	62 850*
Mild impairment	1.0	–0.1	NA	NA	NA	NA
No impairment [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed with the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010 and 2013

The inequality in the prevalence of obesity among people with functional health impairments was even greater among women. Among women with severe impairments, the prevalence was 2.0 (95% CI: 1.8–2.2) times that of women with no impairments. In comparison, the prevalence of obesity among men with severe impairments was 1.4 (95% CI: 1.3–1.6) times that of men with no impairments (Figure 3).

If the prevalence of obesity among people with severe functional health impairments was the same as for people with no functional health impairments, the prevalence in this group would decrease by 38.4%. This inequality was even more pronounced among women, with the potential for a 49.6% reduction in the prevalence of obesity compared with 29.3% for men.

Immigrant Status

The prevalence of obesity among recent immigrants (≤10 years in Canada) and long-term immigrants (>10 years in Canada) was, respectively, 11.6 (95% CI: 9.2–13.9%) and 14.0% (95% CI: 13.2–14.8%). This prevalence was much lower than among non-immigrants, at 20.2% (95% CI: 19.9–20.5%). Compared with non-immigrants, the prevalence of obesity among recent immigrants was 0.6 (95% CI: 0.5–0.7) times. This represents 8.6 (95% CI: 11.1 to 6.2) fewer cases of obesity per 100 among recent immigrants than among non-immigrants (Figure 4).

Income

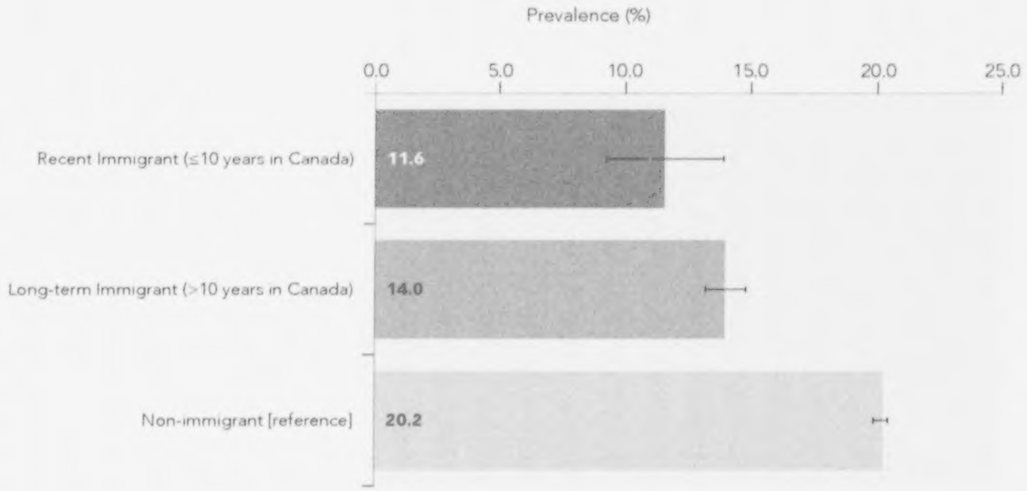
The prevalence of obesity among people in the lowest income quintile was 19.5% (95% CI: 18.7–20.3), which was 1.2 (95% CI: 1.1–1.2) times the prevalence of obesity in the highest income quintile (16.9%; 95% CI: 16.3–17.5).

If the obesity prevalence in the lowest income quintile was the same as that in the highest income quintile, there would be a 13.2% (95% CI: 8.5–17.9%) reduction in this prevalence among people in the lowest income quintile. This would, potentially, result in a 2.6% (95% CI: 1.6–3.7%) reduction in the overall national obesity prevalence and 127 720 (95% CI: 78 350–177 100) fewer Canadians with obesity (Figure 5).

The inequality gradient in obesity prevalence by income was particularly pronounced among women. Women in the lowest income quintile had an obesity prevalence 1.6 (95% CI: 1.4–1.7) times that of women in the highest income quintile. This gradient was not found among men, with men in the lower income groups presenting similar prevalence of obesity as men in the highest income group (Figure 5).

FIGURE 4

Obesity by Immigrant Status, Canada, ages 18+ years, 2010–2013

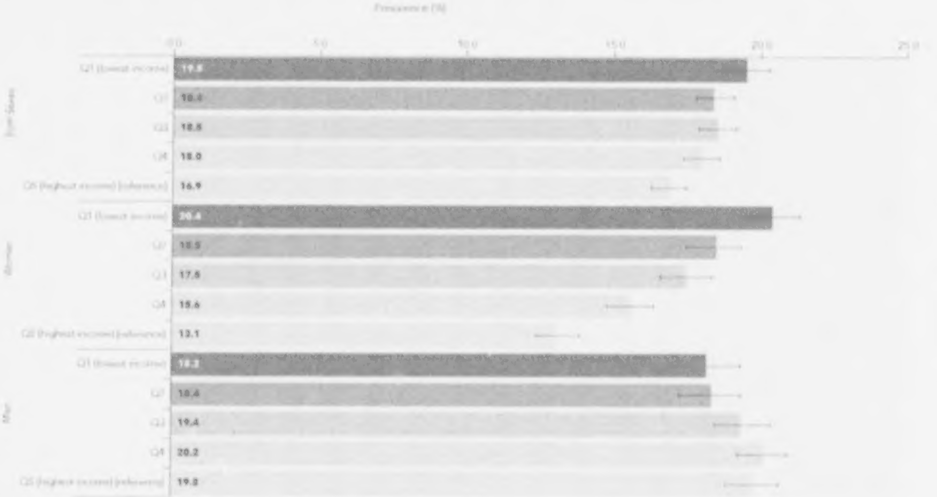


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Recent Immigrant (≤10 years in Canada)	0.6*	−8.6*	NA	NA	NA	NA
Long-term Immigrant (>10 years in Canada)	0.7*	−6.2*	NA	NA	NA	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
*: Significantly different from reference group
Age standardization was performed with the 2011 Census of Population.
Source: Canadian Community Health Survey – Annual Component (CCHS) 2010-2013

FIGURE 5

Obesity by Income Quintile and Sex/Gender, Canada, ages 18+ years, 2010-2013



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Q1 (lowest income)	1.2*	2.6*	13.2*	2.6*	0.5*	127 720*
Q2	1.1*	1.5*	8.3*	1.6*	0.3*	77 040*
Q3	1.1*	1.6*	8.8*	1.7*	0.3*	82 580*
Q4	1.1*	1.1*	6.2*	1.2*	0.2*	58 020*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Q1 (lowest income)	1.6*	7.2*	35.6*	9.2*	1.6*	208 540*
Q2	1.4*	5.4*	29.0*	6.3*	1.1*	144 390*
Q3	1.3*	4.4*	25.1*	4.8*	0.8*	110 210*
Q4	1.2*	2.5*	16.0*	2.7*	0.5*	61 110*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Q1 (lowest income)	0.9*	−1.6*	NA	NA	NA	NA
Q2	0.9*	−1.4	NA	NA	NA	NA
Q3	1.0	−0.3	NA	NA	NA	NA
Q4	1.0	0.4	1.9	0.4	0.1	10 340
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
*: Significantly different from reference group
Age standardization was performed with the 2011 Census of Population.
Source: Canadian Community Health Survey – Annual Component (CCHS) 2010–2013

Education (ages 20+)

The relationship between prevalence of obesity and educational status was inverse. The prevalence of obesity among people with less than a high school education was 24.9% (95% CI: 23.8–26.0%), which was 2.0 (95% CI: 1.8–2.1) times the prevalence among university graduates, at 12.8% (95% CI: 12.2–13.3%) (Figure 6).

If the obesity prevalence among adults with no high school diploma was the same as for university graduates, there would be a 48.7% (95% CI: 45.4–52.0%) reduction in this prevalence among people with no high school diploma. Nationally, this would result in an 8.2% (95% CI: 7.3–9.0%) reduction as well as 396 570 (95% CI: 354 800–438 330) fewer cases of people with obesity.

Inequalities in obesity prevalence by education were more pronounced among women. Women with less than a high school education had a prevalence 2.3 (95% CI: 2.0–2.5) times that of female university graduates. Conversely, men with less than a high school education had an obesity prevalence 1.7 (95% CI: 1.5–1.8) times that of male university graduates.

If the prevalence of obesity among women who had not completed high school was the same as that among women with a university degree, the prevalence in Canada would decrease by 10.1%.

Employment Status and Occupation

Obesity was most prevalent among people who were permanently unable to work compared with all other employment groups, for which this prevalence was approximately the same (18.4–19.6%). The obesity prevalence for people who were permanently unable to work was 28.6% (95% CI: 25.8–31.4%). This was 1.6 (95% CI: 1.4–1.7) times the prevalence among people who had a job in the last week, at 18.4% (95% CI: 18.1–18.8%) (Figure 7).

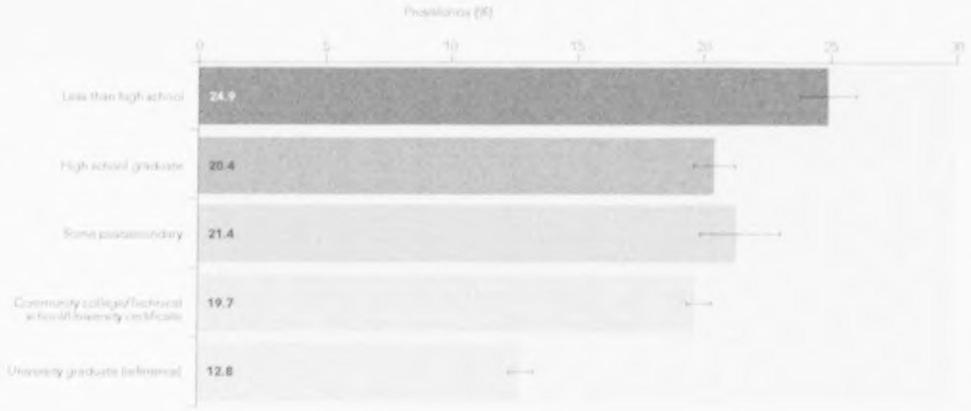
If the prevalence for people permanently unable to work was as low as that for those who reported having a job in the last week, there would be a 35.6% (95% CI: 29.3–41.8%) reduction in obesity among people permanently unable to work, a 1.4% (95% CI: 1.1–1.8%) reduction in obesity overall, and 67 510 (95% CI: 49 080–85 940) fewer cases of obesity among Canadian adults.

By occupational category, adults in semiskilled occupations reported the highest prevalence of obesity, at 20.5% (95% CI: 19.7–21.4%). This was 1.4 (95% CI: 1.3–1.5) times the prevalence of people in professional occupations. If the prevalence of obesity among people in semiskilled occupations was the same as among people in professional occupations, the overall prevalence of obesity in Canada would decrease by 6.9% (95% CI: 5.7–8.1%). The prevalence of obesity was similar among the remaining occupation categories (Figure 7).

Although the prevalence of obesity among women in managerial occupations was the same as among women in professional occupations, for men in managerial occupations, the prevalence was 1.4 (95% CI: 1.2–1.5) times that of men in professional occupations (Annex 1).

FIGURE 6

Obesity by Education Level, Canada, ages 18–75 years, 2010–2013

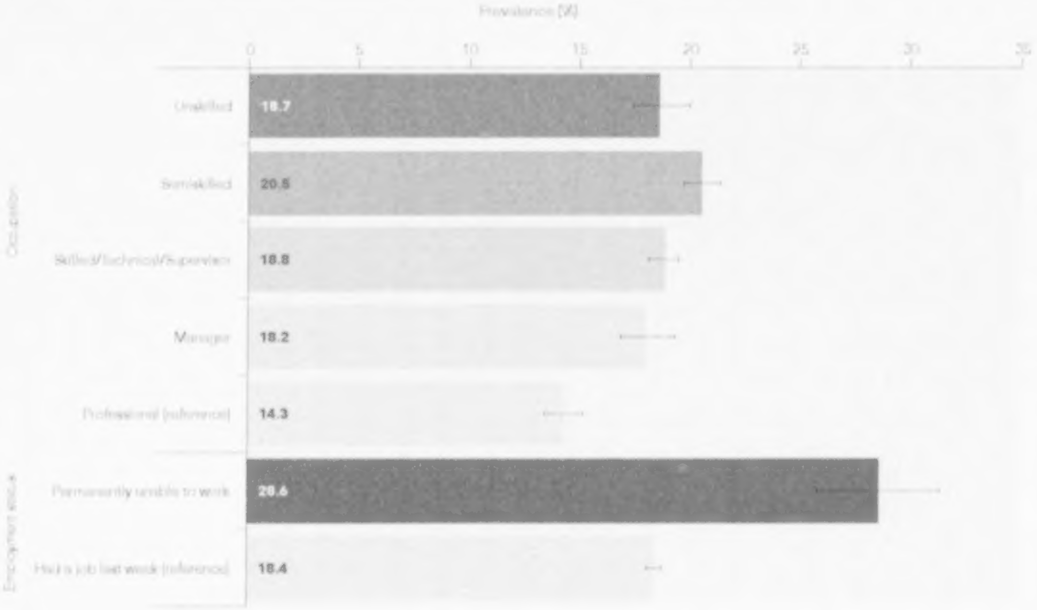


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Less than high school	2.0*	12.1*	48.7*	8.2*	1.5*	396 570*
High school graduate	1.6*	7.6*	37.5*	7.0*	1.3*	340 280*
Some postsecondary	1.7*	8.7*	40.5*	2.7*	0.5*	132 650*
Community college/Technical school/University certificate	1.5*	7.0*	35.3*	13.6*	2.6*	661 950*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference group
Age standardization was performed with the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)-Annual Component 2010-2013

FIGURE 7

Obesity by Employment Status and Occupation, Canada, ages 18–75 years, 2010–2013



OCCUPATION	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Unskilled	1.3*	4.3*	23.2*	1.8*	0.3*	75 360*
Semiskilled	1.4*	6.2*	30.2*	6.9*	1.3*	284 650*
Skilled/Technical/ Supervisor	1.3*	4.5*	23.9*	6.5*	1.2*	269 790*
Manager	1.3*	3.8*	21.1*	1.7*	0.3*	70 320*
Professional [reference]	1.0	0.0	0.0	0.0	0.0	0
EMPLOYMENT STATUS						
Permanently unable to work	1.6*	10.2*	35.6*	1.4*	0.3*	67 510*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference group
Age standardization was performed with the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013

Rural/Urban Residence

The prevalence of obesity was lowest among residents of Canada's three largest cities, Montréal, Toronto, and Vancouver[35], at 14.5% (95% CI: 13.9–15.0%). People living in remote areas reported the highest prevalence of obesity, at 1.3 (95% CI: 1.3–1.4) times that of residents of large urban centres (other than Toronto, Montréal, and Vancouver) (Annex 1).

If prevalence of obesity among people living in remote areas was as low as that among those living in large urban centres (excluding Toronto, Montréal, and Vancouver), this prevalence would decrease by 24.3% (95% CI: 21.3–27.3%) among people in remote areas and by 2.0% (95% CI: 1.7–2.3%) in Canada.

DATA GAPS/LIMITATIONS

Population-based surveys that use height and weight data, taken from direct physical measurements, report higher obesity rates in Canada (6). Data collected by the CCHS are self-reported, and the prevalence of obesity based on these data tends to be underestimated because people tend to under-report their weight and over-report their height. For example, data from the Canadian Health Measures Survey, which directly measured height and weight, showed the obesity rate to be 27% among men and 26% among women (13), whereas our findings suggest the obesity rate is 19.4% among men and 17.0% among women (18.2% overall). Also, although BMI is closely correlated with body fat and a good indicator of health risks (14), it does not account for differences in musculature or bone mass in people and across cultural groups and sex/gender (1).

The data presented in this chapter represent only adults, although childhood obesity is also a concern in Canada.

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (12), calculating *p*-values would confirm statistically significant differences.

These results do not capture the heterogeneous nature of the stratifier groups. For example, the use of a combined cultural/racial background grouping can lead to the over- or underestimation of prevalence due to grouping heterogeneous groups under a single social categorization (15). In addition, the inequalities facing individuals and communities who hold multiple and intersecting social identities were not captured here.

Because the data presented are cross-sectional, inferring causality is not possible. For example, obesity prevalence was higher among those unable to work. While this may be because those who were unable to work were at an increased risk of developing obesity, it may also be that obesity interfered with their ability to be employed. Instead, our analysis was meant to capture the depth and impact of inequalities in obesity prevalence on different socially stratified groups at one point in time. The disproportionate burden of obesity these groups have is driven by a complex system of social and structural drivers of health that remains to be fully explored and understood.

The measures quantify the inequalities experienced by individuals or populations that are defined by their membership in socially identified groups. The inequalities that result from individuals' and communities' experiences of multiple and intersecting identities are not captured here. The inequitable distribution of obesity prevalence within broadly defined social groupings is also not explored.

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35. For definitions of rural/urban subgroups, see the Methodology chapter.

DISCUSSION

At 18.2%, White adults had the highest prevalence of obesity among the cultural/racial groups in Canada. In comparison, the prevalence was particularly low among East/Southeast Asian Canadians, at 5%. Although the prevalence of obesity is low in non-White populations, an Ontario study of ethnic-specific temporal trends in cardiovascular risk factors reported large increases in the prevalence of obesity in groups where prevalence is currently low, such as Chinese and Black men and boys (16). Moreover, certain ethnic groups, such as South Asians, are at an increased risk for obesity-related health problems at lower BMIs due to differences in where body fat is stored (17,18). Inequalities in obesity by cultural and racial group varies in the United States of America (USA), where almost half of non-Hispanic Black adults (48.4%) were obese; this was 1.3 times the prevalence of obesity among non-Hispanic White adults (36.4%) (19). This relationship was more pronounced for women, where the prevalence of obesity among non-Hispanic Black women was 1.5 times that of non-Hispanic White adult women (19).

The prevalence of obesity among people who did not complete high school was twice that of university graduates; this inequality was even greater among women. An inverse association between educational attainment and obesity, also stronger for women, has been previously reported (20). In the United Kingdom, 29.8% of men and 33.0% of women with no educational qualification were obese compared with 20.6% of men and 17.0% of women with a university degree or equivalent (21). One study in Germany found that men and women with only a primary education had a more frequent intake of sugar- and fat-rich foods and a less frequent intake of fruits and vegetables than university graduates (22). In another study, level of education was shown to be positively associated with leisure-time physical activity (23).

Canadians—in particular, women—who reported severe functional impairment also had a higher prevalence of obesity. Multiple factors contribute to these inequalities. In addition to the impairments themselves, barriers to physical activity include social and attitudinal norms related to people with impairments doing physical activities. Built environment features such as safety and accessibility of the community and nearby recreation facilities also play an essential role (10,24-26). Some studies have suggested that the occupational physical activity associated with full-time employment could lower the risk of obesity for some occupational categories (27,28). On the other hand, obesity increases the risk of many health conditions, such as osteoarthritis and diabetes, which in turn, increase the probability of functional impairments as well as the likelihood of being permanently unable to work.

The prevalence of obesity among First Nations people living off reserve, Métis people, Inuit, and First Nations people living on reserve and in northern communities were considerably higher than among non-Indigenous people. Many factors, including climate change, environmental conditions, jurisdictional issues, and historical circumstances have impacted the availability of traditional foods and conditions supporting traditional healthy food and physical activity practices (7,29) (Box 1).

BOX 1
FOCUS ON FIRST NATIONS PEOPLE LIVING ON RESERVE AND IN NORTHERN COMMUNITIES–CONTEXTUALIZING RESULTS FROM THE FIRST NATIONS REGIONAL HEALTH SURVEY

Prepared by the First Nations Information Governance Centre

Elevated obesity rates in First Nations people are a direct result of the longstanding effects of colonial policies, which severed their connection to the land and disrupted the transmission of culture across generations (1). For example, the Indian Residential School system that was used to assimilate First Nations children into the dominant Euro-Canadian culture resulted in generations of First Nations children being forcibly removed from their families and raised in schools that were underfunded, with inadequate facilities and poorly trained staff (30). The schools were insufficient in providing education and cultivating life skills (e.g. health literacy) that may have otherwise offered protective factors against obesity. Malnutrition, hunger, and abuse, including food deprivation, were also rampant throughout the schools and hindered children's psychological and physical development (31). The long-term effects of malnutrition and hunger across generations resulted in metabolic changes that continue to predispose present-day First Nations people to elevated rates of obesity (32). These effects were exacerbated, as many First Nations communities became isolated and devoid of traditional sources of economic sustenance due to the construction of government-controlled and the urbanization of traditional lands (29). Environmental contaminants and degradation (e.g. from foresting and mining industries), and mobility limitations reduced the ability of First Nations people to access nutritious foods from the land. They were prevented from engaging in their traditionally active lifestyles, which included migration for hunting, fishing, gathering, and trade (33). The increased availability of Westernized diets high in energy and sugar-dense foods from grocery stores, along with the cost to transport fresh, nutritious foods to remote areas, further increases their susceptibility for obesity (33,34).

Inequalities in obesity between Indigenous and non-Indigenous communities are also seen elsewhere in the world. In Australia, obesity rates among Aboriginal and Torres Strait Islander people are over 1.5 times that of non-Indigenous people (35). Indigenous peoples in New Zealand also experience high rates of obesity: 66% of Pacific adults and 47% of Maori adults were obese compared with the overall population average of 31% (36).

There is a concern about using the universal criteria for obesity for Inuit, as the BMI cut-offs in use for the overall population may not be appropriate. For the public health impact of increasing cut-off points, more research is needed (37).

Women in the lowest income quintile had a prevalence of obesity higher than those from the highest income quintile. Canadian studies have found associations between neighbourhood disadvantage, local food environment, and obesity. Disadvantaged neighbourhoods tend to have higher concentrations of unhealthy food sources, such as fast food restaurants, with a greater risk for obesity (38-40); they can also lack built environment features, such as street connectivity, safety, green space, and proximity to recreation facilities (41-43), which are associated with observed lower levels of physical activity (42). This inequality gradient for obesity by income has been seen in the United Kingdom (21) and in the USA (44). For example, in the USA, among people living in households whose income was less than $15 000 per year, the prevalence of obesity was 33.8%, whereas only one-quarter (24.6%) of people living in households earning $50 000 or more per year were obese (44).

This pattern of inequality by income was not reported among men, and Canadian men in lower incomes had similar prevalence of obesity as men in the highest-income group. However, one study found that men with higher incomes were more likely than those with lower incomes to spend time at work, commuting, and eating out and were less likely to spend time sleeping. Sedentary behaviour, higher calorie intake, and biological pathways associated with less sleep can all promote weight gain (23).

The complex relationship between occupational category and physical activity may partially account for inequalities in obesity across occupational categories (45). Occupational category was directly associated with leisure-time physical activity, but inversely related to total activity (45). For example, people in white-collar jobs and professional occupations were more likely to engage in sedentary work-related behaviour (e.g. sitting) than blue-collar workers employed in, for example, manual labour positions. Many other occupational factors, such as job strain, working hours, and overtime, also contribute to this relationship.

Recent immigrants (≤10 years) to Canada had lower rates of obesity compared with non-immigrants. In addition, the proportion of new immigrants who were obese was much lower than the proportion of native-born Canadians who were obese (46). The health of recent immigrants is generally better than the health of those born in Canada (reflecting the "healthy immigrant" effect); however, this health advantage tends to decline the longer immigrants live in Canada (47). A scoping review of acculturation and nutritional health of immigrants in Canada found a positive correlation between time since immigration and BMI—obesity among immigrants increased as their length of stay in Canada increased (46).

Obesity is strongly associated with greater morbidity and mortality from such health conditions as type 2 diabetes, asthma, gallbladder disease, arthritis, many cancers, cardiovascular conditions, and depression. Although less common among some population groups, including immigrants and identified cultural/racial minorities, the prevalence of obesity in Canada has increased over the last several decades. Inequalities in obesity are prevalent across a range of social stratifications, including functional health, employment status, occupation, income, education, and Indigenous identity. There is also a socioeconomic gradient in obesity, with rates generally increasing as income levels decrease among women and as education levels decrease in both sexes. There are a number of individual risk factors, including age, nutrition, smoking, and physical inactivity; however, broader social and environmental conditions also greatly affect obesity rates (1). These include income, education, food security, and the built environment.

The systematic measurement of health inequalities of Canadian adults living with obesity will help to inform and strengthen interventions to reduce the revealed differences and related impacts. However, addressing these inequalities in full will also require policy interventions that impact broader influences, such as the availability and accessibility of inexpensive, highly caloric, and highly processed foods, and food marketing (8); social, gender, and cultural norms; and the built environment (8-11). The ongoing monitoring of health inequalities across sociodemographic and socioeconomic groups will enhance understanding of inequalities in obesity, detect changes over time, and further inform programs, policies, and research. Such efforts will also support interventions targeted at the broader determinants of obesity.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for self-reported Obesity.
Data Source: CCHS 2010-2013

					SUMMARY MEASURES									POPULATION IMPACT MEASURES								
Social Stratifiers		Age-Standardized Prevalence (%)			Prevalence Ratio (PR)			Prevalence Difference (PD) per 100			Attributable Fraction (AF%)			Population Attributable Fraction (PAF%)			Population Attributable Rate (PAR) per 100			Population Impact Number (PIN)		
		Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males
Population Groups																						
Socioeconomic Determinants of Health																						

NOTE:

[illegible]

LEGEND

[illegible]

References

(1) Hodgson C, Corscadden L, Taylor A. Obesity in Canada: A joint report from the Public Health Agency of Canada and the Canadian Institute for Health Information. Canadian Institute for Health Information.(2011). 2011;62.

(2) Anis AH, Zhang W, Bansback N, Guh D, Amarsi Z, Birmingham C. Obesity and overweight in Canada: an updated cost of illness study. Obesity Reviews. 2010 Jan;11(1):31-40.

(3) Puhl RM, Heuer CA. Obesity stigma: important considerations for public health. Am J Public Health. 2010;100(6):1019-28.

(4) Puhl RM, Moss-Racusin CA, Schwartz MB, Brownell KD. Weight stigmatization and bias reduction: perspectives of overweight and obese adults. Health Educ Res. 2007;23(2):347-58.

(5) Tjepkema M. Adult obesity. Health reports JID - 9012854 0105.

(6) Navaneelan T, Janz T. Adjusting the scales: Obesity in the Canadian population after correcting for respondent bias. : Statistics Canada; 2014.

(7) Willows ND. Determinants of healthy eating in Aboriginal peoples in Canada: the current state of knowledge and research gaps. Canadian Journal of Public Health/Revue Canadienne de Sante'e Publique. 2005:S32-6.

(8) Swinburn BA, Sacks G, Hall KD, McPherson K, Finegood DT, Moodie ML, et al. The global obesity pandemic: shaped by global drivers and local environments. The Lancet. 2011;378(9793):804-14.

(9) Raine KD. Overweight and obesity in Canada: A population health perspective. : Canadian Institute for Health Information Ottawa; 2004.

(10) Ball K, Carver A, Downing K, Jackson M, O'Rourke K. Addressing the social determinants of inequities in physical activity and sedentary behaviours. Health Promot Int. 2015 Sep;30(2):ii18-9.

(11) Giles-Corti B, Macintyre S, Clarkson JP, Pikora T, Donovan RJ. Environmental and lifestyle factors associated with overweight and obesity in Perth, Australia. American Journal of Health Promotion. 2003;18(1):93-102.

(12) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(13) Statistics Canada. [Internet]. Body composition of adults, 2012 to 2013 [Internet]. Catalogue no. 82-625-X2014001.[updated 2015 27 November, 2015; cited 22 November, 2017]; [about 8 screens]. Available from: http://www.statcan.gc.ca/pub/82-625-x/2014001/article/14104-eng.htm.

(14) Health Canada. Canadian guidelines for body Weight classification in adults (Catalogue H49-179). Ottawa: Health Canada; 2003 [cited 22 November, 2017].

(15) Chen J, Ng E, Wilkins R. The health of Canada's immigrants in 1994-95. Health rep. 1996 Spring;7 Cat. no. 82-003(4):33-46.

(16) Chiu M, Maclagan L, Tu J, Shah B. Temporal trends in cardiovascular disease risk factors among white, South Asian, Chinese and black groups in Ontario, Canada, 2001 to 2012: a population-based study. BMJ Open. 2015 Aug;5(8).

(17) Kohli S, Sniderman AD, Tchernof A, Lear SA. Ethnic specific differences in abdominal subcutaneous adipose tissue compartments. Obesity. 2010;18(11):2177-83.

(18) Rao G, Powell-Wiley TM, Ancheta I, Hairston K, Kirley K, Lear SA, et al. Identification of obesity and cardiovascular risk in ethnically and racially diverse populations: A scientific statement from the American Heart Association. Circulation. 2015 Aug 4;132(5):457-72.

(19) Flegal KM, Kruszon-Moran D, Carroll MD, Fryar CD, Ogden CL. Trends in obesity among adults in the United States, 2005 to 2014. JAMA. 2016;315(21):2284-91.

(20) Cohen AK, Rai M, Rehkopf DH, Abrams B. Educational attainment and obesity: a systematic review. Obesity Review. 2013 Jul;14(12):989-1005.

(21) Public Health England. [Internet]. Adult obesity and socioeconomic status data factsheet [updated 2014 cited 1 December, 2017]; Available from: http://www.noo.org.uk/securefiles/161201_2010//AdultSocioeconomic_Aug2014_v2.pdf.

(22) Finger JD, Tylleskär T, Lampert T, Mensink GB. Dietary behaviour and socioeconomic position: the role of physical activity patterns. PloS one. 2013;8(11):e78390.

(23) McLaren L, Godley J, MacNairn IA. Social class, gender, and time use: implications for the social determinants of body weight? Health reports. 2009;20(4):65.

(24) Kirchner CE, Gerber EG, Smith BC. Designed to deter: community barriers to physical activity for people with visual or motor impairments. Am J Prev Med. 2008;34(4):349-52.

(25) Rimmer JH, Riley B, Wang E, Rauworth A, Jurkowski J. Physical activity participation among persons with disabilities: barriers and facilitators. Am J Prev Med. 2004;26(5):419-25.

(26) Rosenberg DE, Huang DL, Simonovich SD, Belza B. Outdoor built environment barriers and facilitators to activity among midlife and older adults with mobility disabilities. Gerontologist. 2012;53(2):268-79.

(27) Tigbe WW, Lean ME, Granat MH. A physically active occupation does not result in compensatory inactivity during out-of-work hours. Prev Med. 2011;53(1):48-52.

(28) Csizmadi I, Lo Siou G, Friedenreich C, Owen N, Robson P. Hours spent and energy expended in physical activity domains: results from The Tomorrow Project cohort in Alberta, Canada. Int J Behav Mutr Phys Act. 2011 Oct:8-110.

(29) Earle L. Traditional aboriginal diets and health.: National Collaborating Centre for Aboriginal Health/Centre de collaboration nationale de la santé autochtone; 2011.

(30) Boksa P, Joober R, Kirmayer LJ. Mental wellness in Canada's Aboriginal communities: striving toward reconciliation. J Psychiatry Neurosci. 2015 Nov;40(6):363-5.

(31) Mosby I, Galloway T. 'The abiding condition was hunger': assessing the long-term biological and health effects of malnutrition and hunger in Canada's residential schools. British Journal of Canadian Studies. 2017;30(2):147-62.

(32) Mosby I, Galloway T. "Hunger was never absent": How residential school diets shaped current patterns of diabetes among Indigenous peoples in Canada. Can Med Assoc J. 2017;189(32):E1043-5.

(33) Fiddler T. Food security in a northern First Nations community: an exploratory study on food availability and accessibility. International Journal of Indigenous Health. 2012;8(2):5.

(34) Kolahdooz F, Sadeghirad B, Corriveau A, Sharma S. Prevalence of overweight and obesity among indigenous populations in Canada: A systematic review and meta-analysis. Crit Rev Food Sci Nutr. 2017;57(7):1316-27.

(35) Australian National Preventive Health Agency. Evidence brief: obesity prevalence trends in Australia [Internet]. Canberra: Commonwealth of Australia; 2014 [cited 2016 Dec 15]. Available from: http://sydney.edu.au/medicine/research/units/boden/ANPHA%20Obesity%20Prevalence%20Trends.pdf.

(36) New Zealand Ministry of Health. Annual update of key results 2014/15: New Zealand Health Survey. Wellington: Ministry of Health; 2015 [cited 22 November, 2017].

(37) Young TK, Bjerregaard P, Dewailly E, Risica PM, Jørgensen ME, Ebbesson SE. Prevalence of obesity and its metabolic correlates among the circumpolar Inuit in 3 countries. Am J Public Health. 2007;97(4):691-5.

(38) Smoyer-Tomic KE, Spence JC, Raine KD, Amrhein C, Cameron N, Yasenovskiy V, et al. The association between neighborhood socioeconomic status and exposure to supermarkets and fast food outlets. Health Place. 2008;14(4):740-54.

(39) Spence JC, Cutumisu N, Edwards J, Raine KD, Smoyer-Tomic K. Relation between local food environments and obesity among adults. BMC Public Health. 2009;9(1):192.

(40) Polsky JY, Moineddin R, Glazier RH, Dunn JR, Booth GL. Foodscapes of southern Ontario: Neighbourhood deprivation and access to healthy and unhealthy food retail. Can J Public Health. 2014;105(5):e369-75.

(41) Parks SE, Housemann RA, Brownson RC. Differential correlates of physical activity in urban and rural adults of various socioeconomic backgrounds in the United States. J Epidemiol Community Health. 2003 Jan;57(1):29-35.

(42) Turrell G, Haynes M, Wilson L, Giles-Corti B. Can the built environment reduce health inequalities? A study of neighbourhood socio-economic disadvantage and walking for transport. Health Place. 2013;19:89-98.

(43) Estabrooks PA, Lee RE, Gyurcsik NC. Resources for physical activity participation: does availability and accessibility differ by neighborhood socioeconomic status? Annals of behavioral medicine. 2003;25(2):100-4.

(44) Levi J, Segal LM, St Laurent R, Lang A, Rayburn J. F as in fat: how obesity threatens America's future 2012. 2012.

(45) Kirk MA, Rhodes RE. Occupation correlates of adults' participation in leisure-time physical activity: a systematic review. Am J Prev Med. 2011;40(4):476-85.

(46) Sanou D, O'Reilly E, Ngnie-Teta I, Batal M, Mondain N, Andrew C, et al. Acculturation and nutritional health of immigrants in Canada: a scoping review. Journal of Immigrant and Minority Health. 2014;16(1):24-34.

(47) Ng E. The healthy immigrant effect and mortality rates. Health Reports. 2011;22(4):C1.

INEQUALITIES IN
ORAL HEALTH IN CANADA: INABILITY TO CHEW

INEQUALITIES HIGHLIGHTS

- The inability to chew among Canadians who are permanently unable to work is 3.9 times more prevalent than among employed Canadians. This means there are 14.6 more cases of inability to chew per 100 people among Canadians who are permanently unable to work than among those who are currently employed.
- Adults in the lowest income group have a prevalence of inability to chew 3.3 times that of those in the highest income group. This corresponds to 9.2 more cases of inability to chew per 100 people among Canadians in the lowest income group than among those in the highest income group.
- The prevalence of inability to chew among adults with less than a high school education is 2.9 times that of university graduates. This corresponds to 8.3 more cases of inability to chew per 100 people among adults who did not complete high school than among university graduates.
- The prevalence of inability to chew among adults who are often limited in their activities is 2.2 times that of adults with no limitations. This corresponds to 6.9 more cases of inability to chew per 100 people among adults who are often limited in their activities than among those with no limitations.
- The prevalence of inability to chew among people working in unskilled occupations is 2.3 times that of people in professional occupations. This means there are 4.0 more cases of inability to chew per 100 people among those working in unskilled occupations than among those in professional occupations.
- The prevalence of inability to chew for First Nations off reserve and Métis people are, respectively, 1.7 and 1.5 times that of non-Indigenous people. This corresponds to 5.0 and 3.7 more cases of inability to chew per 100 people among First Nations off reserve and Métis people than among non-Indigenous people.

ACRONYM	FULL NAME
CI	Confidence Interval
CCHS	Canadian Community Health Survey
CHMS	Canadian Health Measures Survey
FNOHS	First Nations Oral Health Survey
OECD	Organisation for Economic Co-operation and Development
NIHB	Non-Insured Health Benefits

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Oral health refers to the health of the teeth and gums and related tissues and structures. According to the Canadian Dental Association, good oral health "contribute[s] positively to physical, mental and social well-being and the enjoyment of life's possibilities, by allowing the individual to speak, eat and socialize unhindered by pain, discomfort or embarrassment" (1).

According to the 2007–2009 Canadian Health Measures Survey (CHMS), 96% of Canadian adults have a history of tooth decay, 21% have had a moderate or a severe periodontal (gum) problem, and 12% report an inability to eat certain foods due to oral health problems (2). In addition to being an important health outcome in its own right, poor oral health is associated with other health conditions, such as diabetes, cardiovascular disease, respiratory illnesses, and dementia, all of which affect both incidence rates and disease severity (3). Productivity and social well-being are also affected, as poor oral health and tooth decay can lead to reduced employability and social isolation (3). Risk factors for poor oral health, such as poor nutrition, smoking, and poor oral hygiene, interact with upstream determinants, including socioeconomic status, level of education, food security, water fluoridation, and access to dental care (4).

The majority of dental care in Canada is financed through employer insurance plans, through private insurance, or by individuals. In 2012, Canadians spent $11.7 billion on private dental care, while the federal, provincial, and territorial governments spent $799 million on dental services through publicly funded programs (5). In total, dental care represents over 6% of all health expenditures (6).

Reduced chewing ability is strongly linked to quality of life, tooth loss, nutritional status, and general health outcomes (7–11). While a number of metrics exist for assessing poor oral health (e.g. dental pain, decay–missing–filled teeth index, not visiting a dental professional in the last 12 months), this chapter focuses on the inability to chew as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter.)

METHODS

Data on the inability to chew and stratifier variables were collected primarily through the Canadian Community Health Survey (CCHS) from 2007 to 2008. CCHS respondents were defined as having an inability to chew if they answered no to either of the following questions: "Can you chew firm foods (e.g. meat)?" or "Can you bite off and chew a piece of fresh apple?"

The analysis of inability to chew included people aged 18 and older. Inequalities in oral health prevalence were assessed by measuring differences in inability to chew according to social stratifiers grouped under socioeconomic and sociodemographic stratifiers collected through the CCHS. Sociodemographic stratifiers include sex/gender, Indigenous identity, cultural/racial background, immigrant status, sexual orientation[36] (ages 18–59 years), participation and activity limitation, and rural/urban residence. Socioeconomic stratifiers include income, education (ages 20+ years), occupation, and employment status (ages 18–75 years). Prevalence data were age-standardized using the 2011 Canadian Census of Population.

For the Indigenous identity stratifier, the CCHS sampling frame includes information on Indigenous people who identify as Inuit, Métis, or First Nations living off reserve, but excludes First Nations people living on reserve and Inuit in the Quebec region of Nunavik. For information on oral health among First Nations people living on reserve and in northern communities, see Box 1.

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many such differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported along with their 95% confidence intervals (CIs). Statistical significance was assessed using 95% confidence intervals (12).

Sex/gender-specific inequalities for all of the social stratifiers were also calculated, but reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable fraction, population attributable risk, and population impact number.

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in Canada. (For more detailed information, see the Methodology chapter.)

FINDINGS

The overall prevalence of self-reported inability to chew among Canadians 18 years and older was 7.6% (95% CI: 7.3–7.8%). Inequalities in inability to chew were found across all the social stratifiers except immigrant status and sexual orientation. Differential inequalities were observed for occupation when the data were stratified by sex/gender (Annex 1). (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

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[36] The CCHS does not collect data on sexual orientation from individuals over the age of 59 years.

BOX 1

ORAL HEALTH DATA FOR FIRST NATIONS PEOPLE LIVING ON RESERVE AND IN NORTHERN COMMUNITIES

Prepared by the First Nations Information Governance Centre

Information on oral health for First Nations people living on reserve and in northern communities was collected through the 2009–2010 First Nations Oral Health Survey (FNOHS), led by the First Nations Regional Health Survey Team in coordination with the First Nations Information Governance Committee (a standing committee of the Assembly of First Nations Chiefs Committee on Health), 10 First Nations regional organizations, and the Office of the Chief Dental Officer of Health Canada. The FNOHS aimed to measure the state of oral health, using both self-reported and clinical measures, within a representative sample of First Nations people living in a total of eight remote and non-remote communities across Canada. Self-reported oral health outcomes for participants in the FNOHS can be compared with those of participants in the oral health component of the 2007–2009 CHMS because these two national surveys shared the same standardized protocol developed for the CHMS. However, due to sample size limitations in the FNOHS, the FNOHS and CHMS results presented in this chapter are based on different age ranges. All estimates in the FNOHS were weighted to the Registered First Nations population living on reserve and in northern communities (13).

According to the FNOHS, 39.9% of First Nations people living on reserve and in northern communities aged 12 years and older reported having fair/poor oral health. In contrast, 15.1% of non-Indigenous people aged 6–79 years reported having fair/poor oral health in the 2007-2009 CMHS (note, however, the different age ranges used by the FNOHS and the CHMS, which affects the comparability of these findings). Similarly, more than 3 times as many First Nations people living on reserve and in northern communities (39.7%) as non-Indigenous people (11.9%) reported avoiding particular foods in the past 12 months because of problems with their mouth. In addition, compared with 11.1% of non-Indigenous people, 33.4% of First Nations people living on reserve and in northern communities had chronic pain in their mouth in the past 12 months.

These findings indicate that perceptions of oral health are worse among First Nations. In addition, the avoidance of certain foods and the problem of chronic oral pain suggest greater detrimental effects on quality of life for First Nations living on reserve and in northern communities than for non-Indigenous people in Canada (13).

Sex/Gender

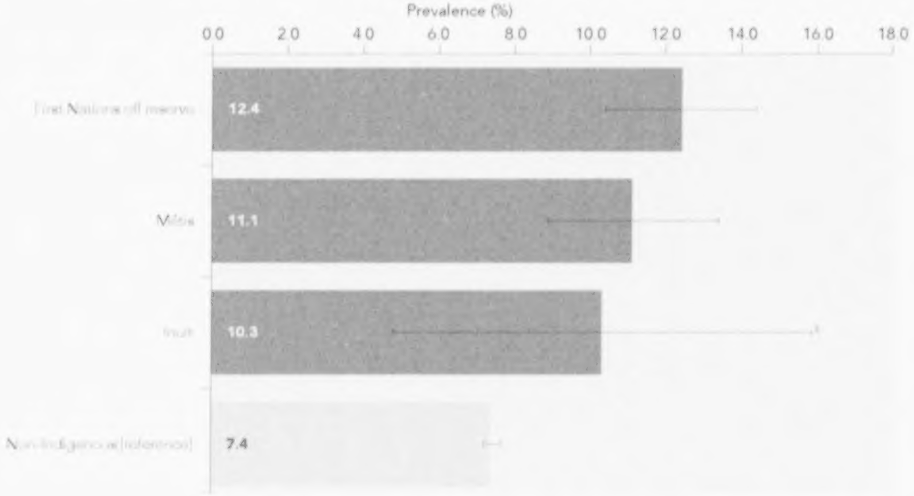
At 8.2% (95% CI: 7.3–7.8%), the prevalence of inability to chew among women was 1.2 (95% CI: 1.1–1.3) times that among men (6.8%; 95% CI: 6.4–7.2%) (Annex 1). If this prevalence was the same for women and men, the prevalence of inability to chew among women would decrease by 17.5% (95% CI: 12.3–22.7%). There would also be 188 300 (95% CI: 127 270–249 330) fewer people unable to chew in Canada.

Indigenous Peoples

Inequalities in the inability to chew differed by specific Indigenous identity group. Prevalence of inability to chew among First Nations adults living off reserve and Métis adults were, respectively, 1.7 (95% CI: 1.4–1.9) and 1.5 (95% CI: 1.2–1.8) times that of non-Indigenous adults. This corresponds to 5.0 (95% CI: 2.9–7.0) and 4.0 (95% CI: 1.4–6.0) more cases of inability to chew per 100 people for First Nations and Métis people, respectively (Figure 1).

FIGURE 1

Inability to Chew by Indigenous Identity, Canada, ages 18+ years, 2007–2008



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
First Nations off reserve	1.7*	5.0*	40.0*	1.0*	0.1*	18 660*
Metis	1.5*	3.7*	33.2*	0.7*	0.1*	13 160*
Inuit	1.4^{E}	2.9^{E}	28.1^{E}	0.0^{E}	0.0^{E}	780^{E}
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0

E: Reportable with caution
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2007–2008

Although prevalence of inability to chew among Inuit adults was 40% higher than among non-Indigenous adults, the difference was not statistically significant. Inability to chew among Inuit women was 2.1 (95% CI: 1.3–3.0) times that of non-Indigenous women. For information on inequalities in oral health among First Nations people living on reserve and in northern communities, see Box 1.

Cultural/Racial Background

East/Southeast Asian and South Asian Canadians reported a prevalence of inability to chew that was, respectively, 1.4 (95% CI: 1.2–1.6) and 1.4 (95% CI: 1.1–1.7) times that of White Canadians. If the prevalence of inability to chew among East/Southeast Asians was as low as that among White Canadians, the prevalence among East/Southeast Asians would decrease by 27.6% (95% CI: 16.3–38.9%). As a result, there would be 42 510 (95% CI: 18 860–66 170) fewer Canadians reporting an inability to chew.

Among other cultural/racial identity groups, the findings did not differ from those of White Canadians.

Participation and Activity Limitation

Participation and activity limitations were directly related to an inability to chew, with prevalence decreasing as limitations decreased. People who frequently had activity limitations had a prevalence of inability to chew that was 2.2 (95% CI: 2.0–2.4) times that of people with no limitations. This represents approximately 7 more cases of inability to chew per 100 people (95% CI: 6.1–7.7) among those who often had limitations (Figure 2).

If the prevalence of inability to chew among people who often had activity limitations was as low as among those with no limitations, there would be a 54.5% (95% CI: 51.1–57.9%) reduction in the prevalence of inability to chew among people who often had activity limitations. This would result in a 12.9% (95% CI: 11.4–14.4%) reduction in the overall national prevalence of inability to chew and, potentially, 236 710 (95% CI: 209 280–264 140) fewer Canadians reporting an inability to chew.

Income

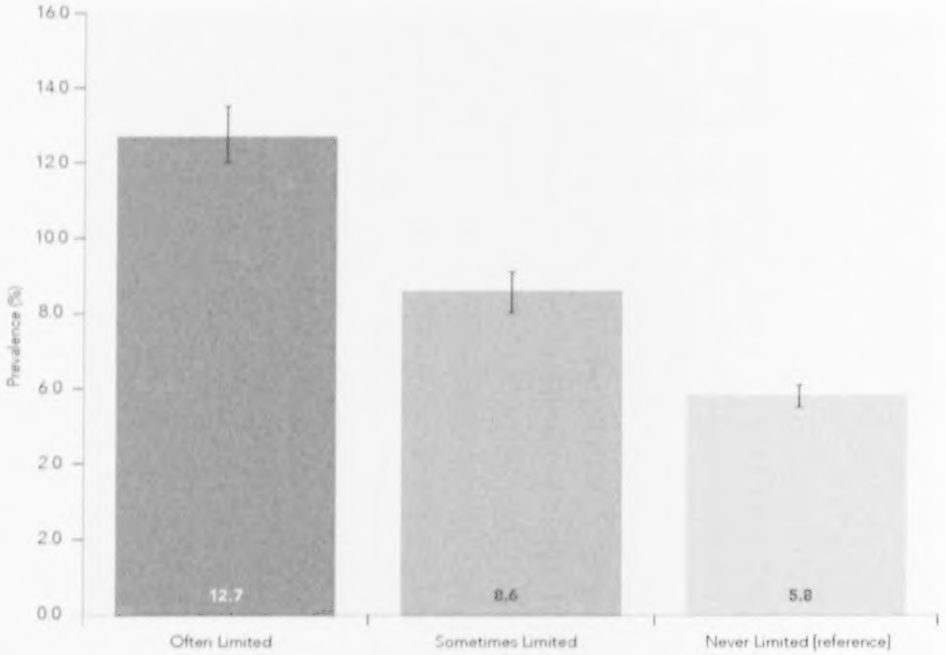
Prevalence of inability to chew decreased as income increased, with this decline following a clear gradient. The prevalence of inability to chew among people in the lowest income quintile was 13.1% (95% CI: 12.3–13.9%), which is 3.3 (95% CI: 2.8–3.8) times that of those in the highest income quintile. This represents 9 more cases of inability to chew for every 100 people in the lowest income quintile (95% CI: 8.2–10.2) (Figure 3).

If the prevalence of inability to chew among people in the lowest income quintile was as low as that among those in the highest income quintile, there would be a 70.1% (95% CI: 65.6–74.6%) reduction in prevalence among people in the lowest income quintile and an overall reduction of 20.7% (95% CI: 18.5–22.9%) in Canada. This would result in 385 670 (95% CI: 343 210–428 140) fewer Canadians reporting an inability to chew.

If all adults had the same prevalence of inability to chew as those in the highest income quintile, 723 030 fewer Canadians would be unable to chew.

FIGURE 2

Inability to Chew by Participation and Activity Limitation, Canada, ages 18+ years, 2007–2008

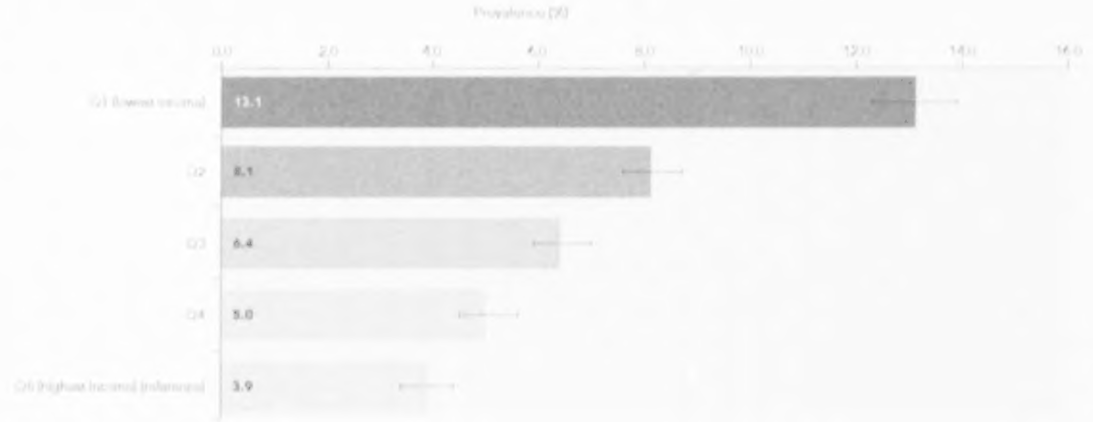


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Often Limited	2.2*	6.9*	54.5*	12.9*	0.9*	236 710*
Sometimes Limited	1.5*	2.8*	32.7*	6.7*	0.5*	122 280*
Never Limited [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2007–2008

FIGURE 3

Inability to Chew by Income Quintile, Canada, ages 18+ years, 2007–2008



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Q1 (lowest income)	3.3*	9.2*	70.1*	20.7*	1.5*	385 670*
Q2	2.1*	4.2*	51.8*	9.6*	0.7*	179 360*
Q3	1.6*	2.5*	39.2*	5.9*	0.4*	109 080*
Q4	1.3*	1.1*	22.2*	2.6*	0.2*	48 920*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q:Quintile
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2007–2008

Education (Ages 20+ Years)

Canadian adults with lower levels of education had a disproportionate burden of inability to chew. Among people with less than a high school education, the prevalence was 2.9 (95% CI: 2.5–3.2) times that of university graduates, a difference that represents 8 cases of inability to chew for every 100 people (95% CI: 8.2–10.2) (Figure 4).

If the prevalence of inability to chew among those with less than a high school education was as low as for university graduates, the prevalence among those with less than a high school education would be 65.2% (95% CI: 60.7–69.5%) lower. This corresponds to a 16.7% (95% CI: 14.7–18.6%) reduction in the overall national prevalence of inability to chew and would, potentially, result in 302 670 (95% CI: 267 350–337 990) fewer Canadians reporting an inability to chew.

> If the prevalence of inability to chew for all adults was the same as that for university graduates, 683 720 fewer Canadians would be unable to chew.

Employment Status and Occupation

Canadians who were permanently unable to work reported a prevalence of inability to chew 3.9 (95% CI: 3.2–4.6) times that of those who had a job in the previous week (Figure 5).

If the prevalence of inability to chew in this subgroup was as low as that among employed Canadians, the prevalence among those who were permanently unable to work would be 74.6% (95% CI: 70.1–79.0%) lower. As a result, the overall prevalence of inability to chew would be reduced by 5.9% (95% CI: 4.6–7.2%), and there would be 86 320 (95% CI: 66 290–106 350) fewer Canadians reporting an inability to chew.

As with income and education, an inability to chew decreased as skill and occupational group level increased. The prevalence of inability to chew among people working in unskilled occupations, semiskilled occupations, and skilled/technical/supervisor roles was, respectively, 2.3 (95% CI: 1.7–2.8), 2.0 (95% CI: 1.5–2.5), and 1.5 (95% CI: 1.2–1.9) times higher than the prevalence among people in professional occupations. The inequality gradient was steeper for men than women (Figure 6).

Rural/Urban Residence

There were modest, but statistically significant, differences in an inability to chew by rural/urban residence[37]. Adults living in remote areas and in small urban centres had a prevalence of inability to chew that was, respectively, 1.2 (95% CI: 1.1–1.3) and 1.2 (95% CI: 1.1–1.4) times that of those living in large urban areas, excluding Montréal, Toronto, and Vancouver (Figure 7).

If the prevalence of inability to chew among those living in small urban centres was as low as those living in large urban centres (other than Montréal, Toronto, and Vancouver), there would be a 19.6% (95% CI: 12.3–26.8%) reduction in the prevalence of inability to chew in small urban centres. This would represent 58 710 (95% CI: 33 260–84 150) fewer cases of inability to chew in Canada (Annex 1).

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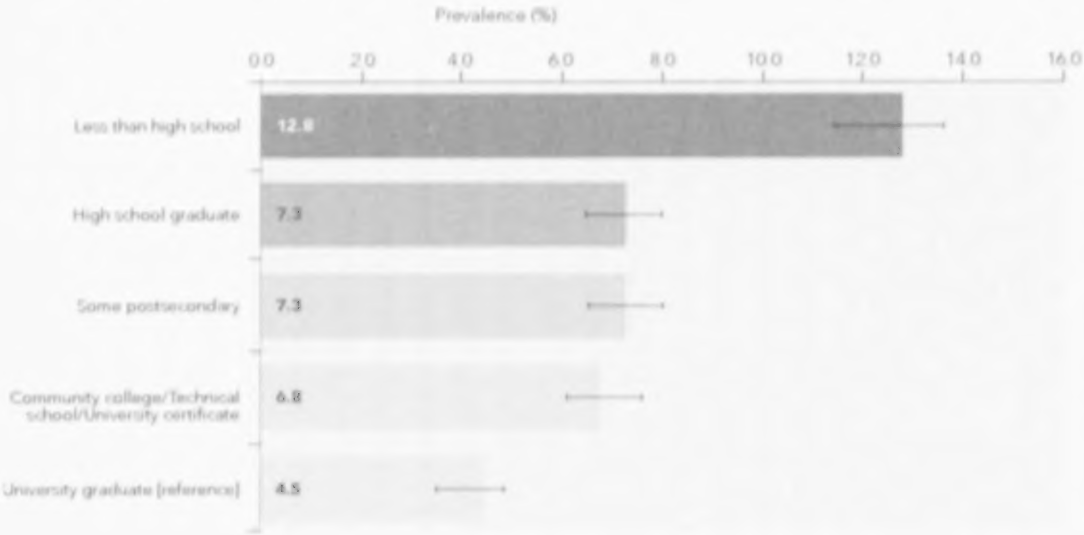
[37] For definition of rural/urban subgroups, see the Methodology chapter.

FIGURE 4

Inability to Chew by Education Level, Canada, ages 20+ years, 2007–2008

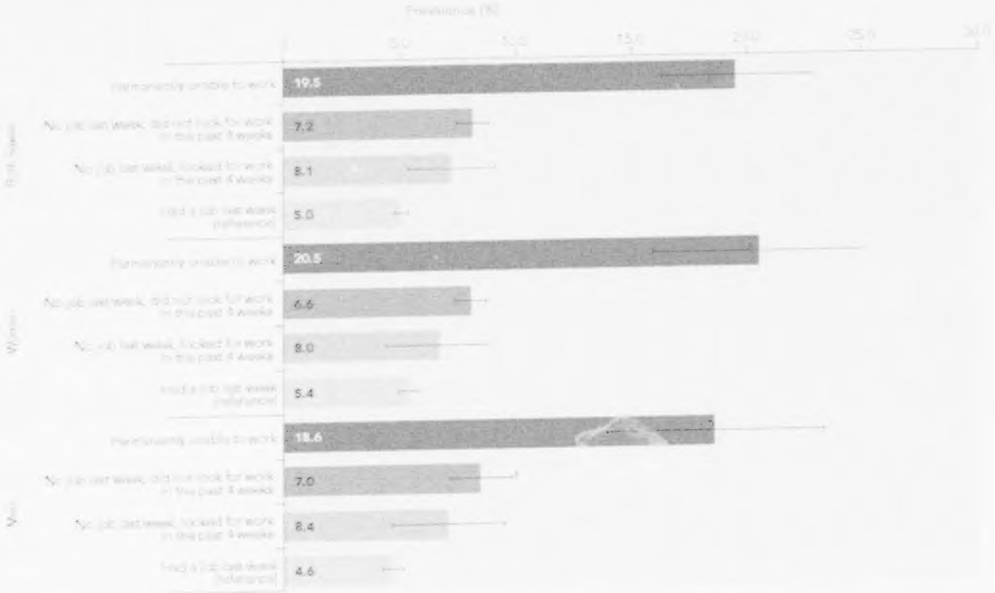


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Less than high school	2.9*	8.3*	65.2*	16.7*	1.2*	302 670*
High school graduate	1.6*	2.9*	39.3*	6.2*	0.5*	111 910*
Some postsecondary	1.6*	2.9*	39.4*	3.1*	0.2*	55 460*
Community college/Technical school/University certificate	1.5*	2.4*	34.7*	11.8*	0.9*	213 680*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS): Annual Component 2007–2008

FIGURE 5

Inability to Chew by Employment Status and Sex/Gender, Canada, ages 18–75 years, 2007–2008

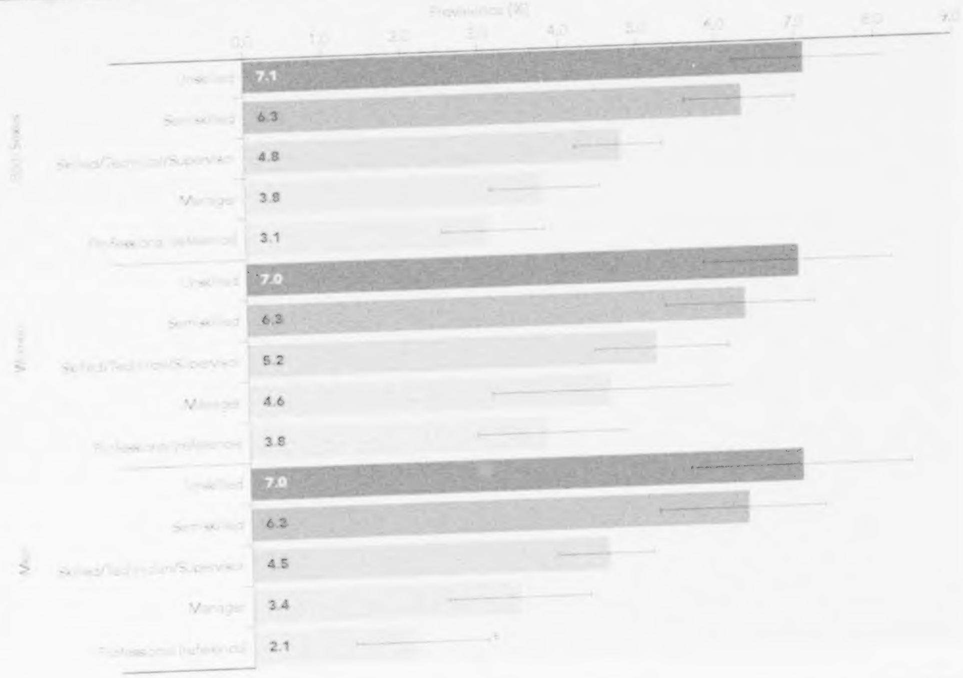


BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Permanently unable to work	3.9*	14.6*	74.6*	5.9*	0.4*	86 320*
No job last week, did not look for work in the past 4 weeks	1.6*	3.1*	38.5*	11.0*	0.7*	161 240*
No job last week, looked for work in the past 4 weeks	1.4*	2.2*	30.7*	1.2*	0.1*	17 790*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Permanently unable to work	3.8*	15.1*	73.7*	5.8*	0.4*	45 990*
No job last week, did not look for work in the past 4 weeks	1.5*	2.6*	32.6*	10.8*	0.7*	85 650*
No job last week, looked for work in the past 4 weeks	1.2	1.2	17.9	0.5E	0.0E	4 250E
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Permanently unable to work	4.0*	14.0*	75.1*	5.9*	0.3*	40 260*
No job last week, did not look for work in the past 4 weeks	1.8*	3.8*	45.0*	10.5*	0.6*	71 280*
No job last week, looked for work in the past 4 weeks	1.5E	2.4E	33.9E	1.6E	0.1E	10 650E
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category.
E: Reportable with caution.
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2007–2008

FIGURE 6

Inability to Chew by Occupation and Sex/Gender, Canada, ages 18–75 years, 2007–2008

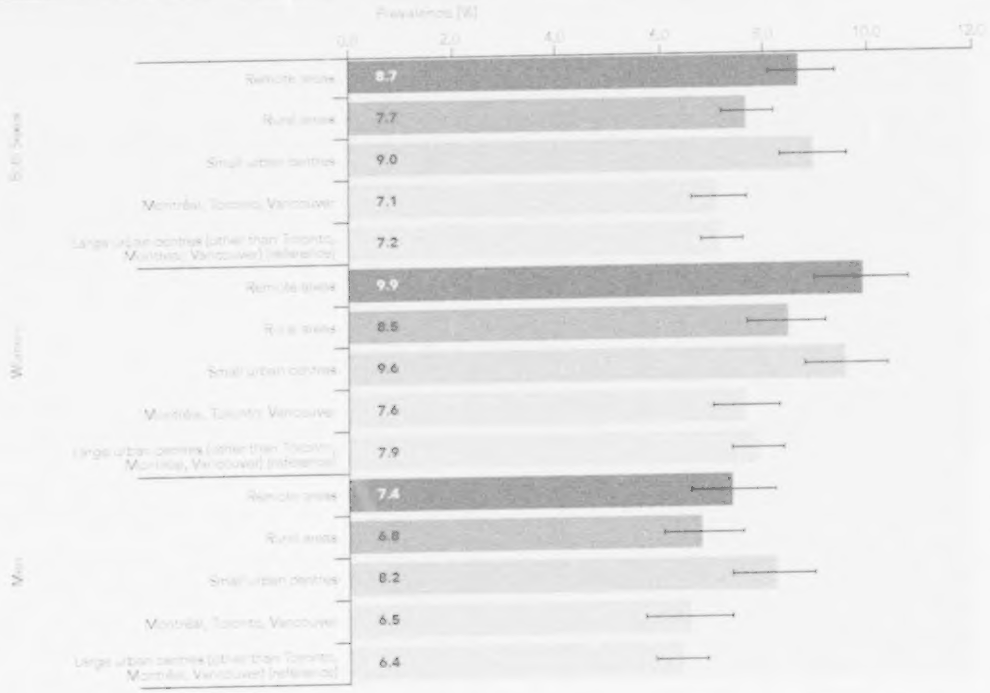


BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Unskilled	2.3*	4.0*	55.9*	5.0*	0.3*	66 560*
Semiskilled	2.0*	3.1*	49.8*	10.2*	0.6*	136 640*
Skilled/Technical/Supervisor	1.5*	1.6*	33.9*	7.2*	0.4*	97 310*
Manager	1.2	0.7	17.2	0.9	0.1	11 610
Professional [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Unskilled	1.8*	3.2*	45.4*	3.7*	0.2*	26 730*
Semiskilled	1.6*	2.4*	38.7*	7.6*	0.5*	55 810*
Skilled/Technical/Supervisor	1.4	1.4*	26.6*	4.3*	0.3*	31 190*
Manager	1.2	0.8	17.4	0.8E	0.0^{E}	5 690^{E}
Professional [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Unskilled	3.3*^{E}	4.8*^{E}	69.3*^{E}	6.5*^{E}	0.3*^{E}	40 100*^{E}
Semiskilled	2.9*^{E}	4.1*^{E}	65.7*^{E}	13.9*^{E}	0.7*^{E}	85 420*^{E}
Skilled/Technical/Supervisor	2.1*^{E}	2.4*^{E}	52.4*^{E}	14.6*^{E}	0.8*^{E}	89 650*^{E}
Manager	1.6^{E}	1.2*^{E}	36.7*^{E}	2.2*^{E}	0.1*^{E}	13 340*^{E}
Professional [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
E: Reportable with caution
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2007–2008

FIGURE 7

Inability to Chew by Rural/Urban Residence and Sex/Gender, Canada, ages 18+ years, 2007–2008



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Remote areas	1.2*	1.5*	17.5*	1.4*	0.1*	26 330*
Rural areas	1.1	0.5	6.1	0.7	0.0	12 540
Small urban centres	1.2*	1.8*	19.6*	3.0*	0.2*	58 710*
Montréal, Toronto, Vancouver	1.0	-0.1	NA	NA	NA	NA
Large urban centres (other than Toronto, Montréal, Vancouver) [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Remote areas	1.3*	2.0*	20.2*	1.7*	0.1*	17 620*
Rural areas	1.1	0.5	6.3	0.7	0.1	7,160
Small urban centres	1.2*	1.7*	17.3*	2.6*	0.2*	28 210*
Montréal, Toronto, Vancouver	1.0	-0.3	NA	NA	NA	NA
Large urban centres (other than Toronto, Montréal, Vancouver) [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Remote areas	1.2*	1.0	13.2*	1.0*	0.1*	8 190*
Rural areas	1.1	0.4	5.7	0.6	0.0	5 140
Small urban centres	1.3*	1.8*	21.8*	3.5*	0.2*	29 620*
Montréal, Toronto, Vancouver	1.0	0.1	1.3	0.4	0.0	3 700
Large urban centres (other than Toronto, Montréal, Vancouver) [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Source: Canadian Community Health Survey (CCHS)–Annual Component 2007–2008

BOX 2
RELATED INDICATOR: DENTAL INSURANCE

In Canada, only 9% of dental insurance is funded through public programs. Two-thirds (67%) of Canadian adults have dental insurance, of which 83.2% is employer-sponsored (14). This leaves a large portion of the adult population in Canada relying on out-of-pocket payments for dental care. A lack of insurance (as well as low income and a low level of education) has been associated with financial barriers to obtaining dental care (15,16).

Findings

Based on data from the 2007–2009 CHMS, inequalities in access to dental insurance are seen by income.

- Among Canadians aged 18 to 79 years, the absence of dental insurance was 2.2 (95% CI: 1.6–2.8) times as high for the lowest income group and 1.8 (95% CI: 1.4–2.2) times as high for the middle income group compared with the highest income group.
- If adult Canadians in the lowest income group had the same prevalence of dental insurance as those in the highest income group, there would be 365 500 (95% CI: 213 500–517 500) fewer Canadian adults without dental insurance. Likewise, if adults in the middle income group matched the prevalence of dental insurance in the highest income group, there would be 2 646 000 (95% CI: 1 599 000–2 962 500) fewer Canadian adults without dental insurance. Other research using the same data detected a clear income gradient with respect to avoidance of professional dental care because of cost: as income increased, avoidance decreased (17).

DATA GAPS/LIMITATIONS

This analysis looks at only one indicator of poor oral health: the inability to chew. There are other metrics of oral health, including rates of tooth decay (and the consequences of untreated tooth decay), rates and severity of gum and periodontal disease, and access to dental care. Many of these are inter-related (e.g. tooth decay can be a precursor to inability to chew), and inequalities between population groups are often seen across multiple indicators of oral health (3).

Data from CCHS are self-reported and may therefore underestimate the extent to which people have an inability to chew. For example, people may be reluctant to admit they are unable to chew if they perceive this to be stigmatizing. The data presented are also only for adults. Inequalities in oral health in children and youth across different social stratifiers may follow different distribution patterns than those among adults. For example, Inuit teenagers had nearly 4 times the number of decayed, missing, or filled teeth compared with teenagers living south of the 60th parallel, whereas Inuit adults had 1.6 times the number of decayed, missing, or filled teeth compared with their southern counterparts (18).

A major limitation in the FNOHS, which provides information on oral health among First Nations people living on reserve and in northern communities, is the absence of variance estimates (95% CIs; coefficients of variation). These are not reported due to the design effect. Only 8 communities in which more than 500 people live (one urban/rural community and one remote/special access community for each of the four regions) were funded for the study. The inclusion of a greater number of communities would have helped to decrease the design effect. The smaller sample size of the FNOHS (1 188) compared with the 2007–2009 CHMS (5 586) also necessitated combining age groups to allow for comparisons to be made between them. Thus, while FNOHS findings were presented alongside those of the CHMS (Box 1), conclusions about differences observed among the results of the two surveys should be approached with caution (13).

Because the data presented are cross-sectional in nature, inferring causality is not possible. For example, an inability to chew was higher among those who were permanently unable to work. This may be because those who were permanently unable to work were at an increased risk of developing an inability to chew (e.g. lower income from being unable to work resulting in an inability to afford dental care or properly fitting dentures). Alternatively, any pain associated with an inability to chew may interfere with the ability to work. Instead, the current analysis captured the depth and impact of inequalities related to an inability to chew on different socially stratified groups at a given point in time.

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (12), calculating *p*-values would confirm statistically significant differences.

These results do not capture the heterogeneous nature of the stratifier groups. A recent study in Nova Scotia noted much higher rates of decayed teeth among refugees than among immigrants. The same study also found large differences between self-reported and clinically determined dental care needs among immigrants, refugees, and people born in Canada (19). Comparing the immigrant population as a whole to the non-immigrant population does not capture the nuances of inequality within and between different immigrant populations. Rather, doing so can lead to an over- or underestimation of the health burden these groups face (20). In addition, the inequalities facing individuals and communities who hold multiple and intersecting social identities were not captured here.

DISCUSSION

Oral health is an integral part of overall health and well-being. While the majority of Canadians report good oral health, important inequalities—as measured by an inability to chew—were observed in the current analysis across a range of social stratifiers, including income, education, employment status and occupation, Indigenous identity, and participation and activity limitations.

A slightly higher proportion of women than of men report an inability to chew. The CHMS noted that women had a higher mean number of missing and filled teeth and were more likely to report oral pain, whereas men had a higher mean number of decayed teeth (21). Research in the United Kingdom has shown that women bear a disproportionate burden of poor oral health (22).

Those who are permanently unable to work have a prevalence of inability to chew 4 times as high as those who are currently employed. Canadians in the lowest income bracket and those with the lowest level of education reported a prevalence of inability to chew that is 3 times as high as those with the highest income and education levels, respectively. These socioeconomic determinants interact with a range of complex contextual factors to produce inequalities in oral health. These include access to adequate nutrition, access to dental care and prevention services, water fluoridation, smoking and alcohol use, and other environmental, psychosocial, and behavioural determinants of health (23). Other Canadian studies, using data from the CHMS, have found an association between low socioeconomic status and poor outcomes related to oral health (24), as have studies in the United States of America (USA) (25), Australia (26), New Zealand (27), and the United Kingdom (22).

Although our findings showed a slightly higher prevalence of inability to chew among women than among men (8.2% versus 6.8%), no income-related sex/gender inequalities in oral health outcomes were noted. Other Canadian research suggests greater income-related inequalities among women (3,21).

A disproportionate burden of inability to chew affects Canadians with participation and activity limitations. An important part of perceived health and well-being among Canadians is the degree to which physical, mental, or health conditions contribute to participation and activity limitations at home, at work, or at school. In particular, people living with physical or mental disabilities and those living in long-term care facilities face an inequitable burden of poor oral health (28). Some of the excess burden of poor oral health that affects people with participation and activity limitations is related to their chewing problems, which in turn contribute to such limitations.

Oral health and other health problems interact in complex ways, with one often increasing the risk or severity of the other. Both participation and activity limitations and poor oral health can affect social well-being and socioeconomic status through their effects on access to employment, income, and education (29). People living with physical or developmental disabilities may face barriers to caring for their oral health and accessing oral health care, including financial barriers, physical and equipment limitations, and social barriers, such as fear of dental care or experiences of stigma or discrimination(28). Poor oral health can impact general health in many ways, for example, by causing pain; by disrupting physical, psychological, and social functioning; by impeding the intake of nutrients; and by disrupting work, school, or sleep (30).

Indigenous peoples report a higher prevalence of inability to chew than do non-Indigenous people. The prevalence varies among First Nations people living on reserve, First Nations people living off reserve, Métis people, and Inuit. Although the difference in prevalence of inability to chew between Inuit and non-Indigenous people was not statistically significant in our findings, the Inuit Oral Health Survey 2008–2009 found that 28.8% of respondents aged 20 to 39 years and 35.6% of respondents aged 40 years and older reported avoiding foods because of problems with their mouth; these differences were statistically significantly higher than the reported prevalence among southern Canadians. The Inuit Oral Health Survey also highlighted inequalities across various oral health indicators for Inuit survey participants compared with people living south of the 60th parallel (18) (Box 3). Similar inequalities have been reported for Indigenous Australians (31) and Maori and Pacific peoples in New Zealand versus their non-Indigenous counterparts (27).

BOX 3

FOCUS ON FIRST NATIONS PEOPLE LIVING ON RESERVE AND IN NORTHERN COMMUNITIES– CONTEXTUALIZING RESULTS FROM THE FIRST NATIONS ORAL HEALTH SURVEY

Prepared by the First Nations Information Governance Centre

Although the state of oral health varies across First Nations communities, the disproportionately poor outcomes on a national scale may be the result of several common and inter-related factors. The rural, small, and/or remote nature of some communities can hinder socioeconomic development and health care accessibility, including preventive health care (e.g. shortage of timely dental services) (32). While regular dental cleanings and exams are crucial for maintaining oral health, other important measures include access to water fluoridation and safe drinking water (e.g. for daily teeth brushing) (33). Ample evidence suggests that many First Nations communities lack the necessary infrastructure for reliable water fluoridation and safe drinking water (34). Further, the effects of colonization on the environmental conditions of communities (e.g. urbanization of traditional lands, pollution), and the costs and restrictions to hunting and fishing practices, has diminished accessibility to traditional foods that are rich in micronutrients, and has increased the availability of Westernized diets, which are high in sugar and directly diminish oral health (33,35). Moreover, food insecurity contributes to disproportionate rates of chronic conditions (e.g. diabetes) among First Nations peoples, which also increase their susceptibility for periodontal disease (35,36). Poor oral health can also be transmitted across generations, both prenatally, through the effects of mothers' oral health on fetal development, and through the transference of poor health literacy practices from caregiver to child (37–40). The latter may be especially problematic for First Nations children, who are disproportionately represented in the foster care system and face added barriers to care, including factors that disrupt medical records and consistency of care (e.g. follow-up and/or restorative visits), such as caseload burden of caregivers and transience between placements (41).

Although federal programs, including the Non-Insured Health Benefits (NIHB) program, provide dental care coverage to First Nations and recognized Inuit, significant geographical, language, and sociocultural barriers remain in the care available to these groups (28). Between 2013 and 2015, only 48% of eligible First Nations and Inuit people accessed NIHB dental services (42). Cost is therefore only one of many barriers to care that need to be addressed to reduce oral health inequalities (Box 3). Similarly, in Australia, the disproportionate burden of poor oral health outcomes experienced by Indigenous people is partly attributed to a lack of culturally appropriate and timely dental care, particularly in rural and remote areas (31).

Access to dental care is one important driver of inequalities in oral health. Compared with most Organisation for Economic Co-operation and Development (OECD) countries, Canada contributes a low proportion of public funds to dental care—approximately 6.0% in 2011. In the same period, the USA contributed 7.9% of public funds, while Finland, which has among the highest public contributions to dental care, contributed 79% (3). Canada performs poorly in terms of equitable access to care, with some of the largest differences in dental care access between high and low income brackets among OECD nations (3).

Disadvantaged Canadians who face the highest burden of poor oral health also experience the greatest financial barriers to accessing dental care (3). In 2010–2013, almost two-thirds (64.5%) of Canadian adults reported consulting a dentist, dental hygienist, or orthodontist at least once in the past 12 months compared with 43.3% of Canadian adults with less than a high school education, 50.5% of recent adult immigrants, 55.7% of First Nations adults living off reserve, 54.8% of Métis adults, and 49.5% of Inuit adults (43). According to data from the 2007–2009 CHMS, 49.8% of Canadians living in low income had neither private nor public dental insurance, and 34.5% had avoided visiting a dental professional within the past 12 months due to the cost (2). In part due to a lack of access to care, inequalities are steeper for outcomes related to oral health than for many other health outcomes in Canada (3).

Poor oral health is linked to reduced quality of life and social connectedness and worse general mental and physical health outcomes as well as to diabetes, cardiovascular disease, respiratory illness, and other conditions (3). While the inability to chew is only one indicator of oral health, it paints a striking picture of inequalities across population groups. These inequalities are prevalent across a range of stratifications, including employment status, occupation, and Indigenous identity. There is also a clear socioeconomic gradient in oral health, with rates of inability to chew increasing as household incomes, education, participation and activity limitation, and occupational skill levels decrease. While individual risk factors such as poor nutrition, smoking, and poor oral hygiene play a role, the higher prevalence of inability to chew observed in some populations is strongly influenced by social determinants of health. Fully addressing these inequalities will require policy interventions to impact broader influences such as food security, water fluoridation, and access to care (4).

The systematic measurement of health inequalities of Canadian adults living with the inability to chew is needed to monitor inequalities at the individual level and across sociodemographic and socioeconomic groups. Such information can serve to inform interventions, policy, programs, and research intended to reduce the revealed differences and related impacts. The ongoing monitoring of health inequalities in oral health can also identify changes over time.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Oral Health, inability to chew.
Data Source: CCHS 2007–2008

					SUMMARY MEASURES										POPULATION IMPACT MEASURES							
Social Stratifiers		Age-Standardized Prevalence (%)			Prevalence Ratio (PR)			Prevalence Difference (PD) per 100			Attributable Fraction (AF%)			Population Attributable Fraction (PAF%)			Population Attributable Rate (PAR) per 100			Population Impact Number (PIN)		
		Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males
Overall	Both Sexes	7.6	8.2	6.8	NA									NA								
Population Groups																						
Sex/Gender	Female	8.2	NA		NA	1.2 *	NA	NA	1.4 *	NA	NA	17.5 *	NA	NA	9.8 *	NA	NA	0.7 *	NA	NA	158,300 *	NA
	Male (reference)	6.8			Reference																	
Indigenous identity	First Nations, off reserve	12.4	13.7	10.9	1.7 *	1.7 *	1.6 *	5.0 *	5.7 *	4.1 *	40.0 *	41.3 *	38.0 *	1.0	1.0 *	0.9 *	0.1 *	0.1 *	0.1 *	18,860 *	11,220 *	7,390 *
	Métis	11.1	11.6	10.4	1.5 *	1.4 *	1.5 *	3.7 *	3.5 *	3.7 *	33.2 *	30.3 *	35.3 *	0.7 *	0.6 *	0.8 *	0.1 *	0.0 *	0.1 *	13,160 *	5,990 *	6,760 *
	Inuit	10.3 E	17.3 E	F	1.4 E	2.1 * E	F	2.9 E	9.3 * E	F	28.1 E	53.5 * E	F	0.0 E	0.1 * E	F	0.0 E	0.0 * E	F	780 E	1,070 * E	F
	Non-Indigenous (reference)	7.4	8.1	6.7	Reference																	
Cultural/racial background	Black	5.8 E	7.2 E	F	0.8 E	0.9 E	F	-1.4 E	-0.6 E	F	NA E	NA	F	NA	NA	F	NA	NA	F	NA	NA	F
	East/Southeast Asian	10.0	11.2	8.5	1.4 *	1.4 *	1.1	2.7 *	3.4 *	2.0	27.6 *	30.6 *	23.1	2.2 *	2.6 *	1.6	0.2 *	0.2 *	0.1	42,510 *	28,480 *	14,030
	South Asian	9.9	10.9	8.7 E	1.4 *	1.4	1.3 E	2.7 *	3.1	2.2 E	27.0 *	28.1	25.0 E	1.2 *	1.2	1.1 E	0.1 *	0.1	0.1 E	23,420 *	12,940	9,890 E
	Arab/West Asian	10.7 E	F	12.0 E	1.5 E	F	1.8 E	3.5 E	F	5.5 E	32.5 E	F	45.8 E	0.7 E	F	1.3 E	0.1 E	F	0.1 E	12,820 E	F	11,620 E
	Latin American	7.9 E	8.5 E	11.4 E	1.1 E	1.1 E	1.8 E	0.7 E	0.7 E	4.9 E	9.1 E	8.5 E	42.9 E	0.1 E	0.1 E	1.0 E	0.0 E	0.0 E	0.1 E	2,280 E	1,020 E	8,480 E
	Other/Multiple origins	7.5 E	9.6 E	F	1.0 E	1.2 E	F	0.3 E	1.6 E	F	4.0 E	18.8 E	F	0.0 E	0.2 E	F	0.0 E	0.0 E	F	770 E	2,440 E	F
	White (reference)	7.2	7.8	6.5	Reference																	
Sexual orientation (aged 15 – 59)	Bisexual	6.4 E	7.4 E	F	1.4 E	1.5 E	F	1.7 E	2.3 E	F	27.1 E	31.5 E	F	0.3 E	0.5 E	F	0.0 E	0.0 E	F	2,790 E	2,450 E	F
	Lesbian/Gay	6.4 E	7.2 E	6.5 E	1.4 E	1.4 E	1.5 E	1.8 E	2.1 E	2.2 E	27.8 E	29.6 E	34.6 E	0.5 E	0.4 E	0.8 E	0.0 E	0.0 E	0.0 E	4,170 E	1,920 E	3,220 E
	Heterosexual (reference)	4.7	5.1	4.2	Reference																	
Participation and activity limitation	Often	12.7	14.1	11.1	2.2 *	2.3 *	2.1 *	6.9 *	8.0 *	5.7 *	54.5 *	56.6 *	51.4 *	12.9 *	14.3 *	11.2 *	0.9 *	1.1 *	0.7 *	236,710 *	147,300 *	89,740 *
	Sometimes	8.6	9.8	7.1	1.5 *	1.6 *	1.3 *	2.8 *	3.7 *	1.7 *	32.7 *	37.7 *	24.2 *	6.7 *	6.3 *	4.4 *	0.5 *	0.7 *	0.3 *	122,280 *	85,300 *	35,610 *
	Never (reference)	5.8	6.1	5.4	Reference																	
Immigrant status	Recent	10.0	11.4 E	8.7 E	1.3	1.4 E	1.3 E	2.5	3.3 E	2.0 E	25.5	29.1 E	22.9 E	2.2	2.6 E	1.9 E	0.2	0.2 E	0.1 E	42,940	28,290 E	16,690 E
	Long-term	7.5	8.0	6.9	1.0	1.0	1.0	0.1	0.0	0.2	0.9	NA	2.7	0.2	NA	0.4	0.0	NA	0.0	2,930	NA	3,160
	Non-immigrant (reference)	7.4	8.1	6.7	Reference																	
Rural/urban residence	Remote areas	8.7	9.9	7.4	1.2 *	1.3 *	1.2 *	1.5 *	2.0 *	1.0	17.5 *	20.2 *	13.2 *	1.4 *	1.7 *	1.0 *	0.1 *	0.1 *	0.1 *	26,330 *	17,620 *	8,190 *
	Provincial rural areas	7.7	8.5	6.8	1.1	1.1	1.1	0.5	0.5	0.4	6.1	6.2	5.7	0.7	0.7	0.6	0.0	0.1	0.0	12,540	7,160	5,140
	Small urban centres	9.0	9.6	8.2	1.2 *	1.2 *	1.3 *	1.8 *	1.7 *	1.8 *	19.6 *	17.3 *	21.8 *	3.0 *	2.6 *	3.5 *	0.2 *	0.2 *	0.2 *	56,710 *	28,210 *	29,620 *
	Toronto, Montreal, and Vancouver	7.1	7.6	6.5	1.0	1.0	1.0	-0.1	-0.3	0.1	NA	NA	1.3	NA	NA	0.4	NA	NA	0.0	NA	NA	3,700
	Large urban centres other than Toronto, Montreal and Vancouver (reference)	7.2	7.9	6.4	Reference																	
Socioeconomic Determinants of Health																						
Income quintile – provincial	Q1 (lowest income)	13.1	12.9	13.2	3.3 *	3.1 *	3.6 *	9.2 *	8.7 *	9.5 *	70.1 *	67.2 *	72.0 *	20.7 *	20.6 *	20.2 *	1.5 *	1.6 *	1.3 *	385,670 *	211,830 *	167,170 *
	Q2	8.1	8.6	7.5	2.1 *	2.0 *	2.0 *	4.2 *	4.4 *	3.8 *	51.5 *	50.8 *	51.0 *	9.6 *	9.6 *	9.3 *	0.7 *	0.8 *	0.6 *	179,360 *	95,880 *	76,670 *
	Q3	6.4	6.8	6.0	1.6 *	1.6	1.6 *	2.5 *	2.6	2.3 *	39.2 *	34.3	38.5 *	5.9 *	5.5	6.0 *	0.4 *	0.4	0.4 *	109,080 *	56,550	50,090 *
	Q4	5.0	5.3	4.8	1.3 *	1.3	1.2	1.1 *	1.1	1.1	22.2 *	20.5	22.8	2.6 *	2.1	3.2	0.2 *	0.2	0.2	48,920 *	21,460	26,110
	Q5 (highest income) (reference)	3.9	4.2	3.7	Reference																	
Education (aged 20+)	Less than high school	12.8	12.9	12.6	2.9 *	2.6 *	3.1 *	8.3 *	8.0 *	8.6 *	65.2 *	61.9 *	68.2 *	16.7 *	15.1 *	15.4 *	1.2 *	1.2 *	1.2 *	302,670 *	150,370 *	150,740 *
	High school graduate	7.3	8.0	6.7	1.6 *	1.6 *	1.7 *	2.9 *	3.1 *	2.7 *	39.3 *	38.3 *	40.3 *	6.2 *	6.3 *	6.1 *	0.5 *	0.5 *	0.4 *	111,910 *	62,350 *	50,050 *
	Some postsecondary	7.3	8.2	6.6	1.6 *	1.7 *	1.6 *	2.9 *	3.3 *	2.6 *	39.4 *	40.0 *	37.5 *	3.1 *	3.2 *	2.8 *	0.2 *	0.3 *	0.2 *	55,460 *	31,770 *	22,970 *
	Community college/Technical school/University certificate	6.0	7.4	6.2	1.5 *	1.5 *	1.6 *	2.4 *	2.4 *	2.2 *	34.7 *	32.9 *	35.7 *	11.3 *	11.2 *	12.1 *	0.9 *	0.9 *	0.8 *	213,680 *	111,170 *	99,390 *
	University graduate (reference)	4.5	4.9	4.0	Reference																	
Employment status (aged 15–75)	Permanently unable to work	19.5	20.5	18.6	3.9 *	3.8 *	4.0 *	14.6 *	15.1 *	14.0 *	74.6 *	73.7 *	75.1 *	5.9 *	5.5 *	5.9 *	0.4 *	0.4 *	0.3 *	86,320 *	45,990 *	40,260 *
	No job last week, looked for work in the past 4 weeks	7.2	6.6	7.0 E	1.4 *	1.2	1.5 E	2.2 *	1.2	2.4 E	30.7 *	17.9	33.9 E	1.2 *	0.5 E	1.6 E	0.1 *	0.0 E	0.1 E	17,790 *	4,250 E	10,650 E
	No job last week, did not look for work in the past 4 weeks	8.1	8.0	8.4	1.6 *	1.5 *	1.8 *	3.1 *	2.6 *	3.8 *	36.5 *	32.6 *	45.0 *	11.0 *	10.8 *	10.5 *	0.7 *	0.7 *	0.6 *	161,240 *	85,650 *	71,290 *
	Had a job last week (reference)	5.0	5.4	4.6	Reference																	
Occupation (aged 15–75)	Unskilled	7.1	7.0	7.0	2.3 *	1.8 *	3.3 * E	4.0 *	3.2 *	4.8 * E	55.9 *	45.4 *	69.3 * E	5.0 *	3.7 *	6.5 * E	0.3 *	0.2 *	0.3 * E	66,560 *	26,730 *	40,100 * E
	Semiskilled	6.3	6.3	6.3	2.0 *	1.6 *	2.9 * E	3.1 *	2.4 *	4.1 * E	49.5 *	38.7 *	65.7 * E	10.2 *	7.6 *	13.9 * E	0.6 *	0.5 *	0.7 * E	138,640 *	55,810 *	85,420 * E
	Skilled/Technical/Supervisor	4.6	5.2	4.5	1.5 *	1.4	2.1 * E	1.6 *	1.4 *	2.4 * E	33.9 *	26.6 *	52.4 * E	7.2 *	4.3 *	14.6 * E	0.4 *	0.3 *	0.6 * E	97,210 *	31,190 *	59,650 * E
	Manager	3.8	4.6	3.4	1.2	1.2	1.6 E	0.7	0.8	1.2 * E	17.2	17.4	36.7 * E	0.9	0.8 E	2.2 * E	0.1	0.0 E	0.1 * E	11,610	5,690 E	13,340 * E
	Professional (reference)	3.1	3.8	2.1 E	Reference																	

NOTE:

[illegible]

[illegible]

LEGEND

		PR	PD per 100
Not applicable	NA	≥ 2.3	≥ 15.2
Not reportable	F	1.7 → 2.3	10.5 → 15.2
Interpret with Caution	E	1.5 → 1.7	7.9 → 10.5
Statistically Significant	*	1.4 → 1.5	5.8 → 7.9
Reference	▨	1.2 → 1.4	4.4 → 5.8
		1.0 → 1.2	0.0 → 4.4

Larger Inequality

Smaller Inequality

References

(1) Canadian Dental Association. [Internet]. Your Oral Health [updated 2015 Available from: http://www.cda-adc.ca/en/oral_health/index.asp.

(2) Health Canada. Summary report on the findings of the oral health component of the Canadian Health Measures Survey 2007-2009 [Internet]. Ottawa, ON: Health Canada; 2010 Available from: http://publications.gc.ca/site/eng/369653/publication.html#.

(3) Canadian Academy of Health Sciences (CAHS). Improving access to oral health care for vulnerable people living in Canada [Internet]. Ottawa, ON: Canadian Academy of Health Sciences; 2014 Available from: http://cahs-acss.ca/wp-content/uploads/2015/07/Access_to_Oral_Care_FINAL_REPORT_EN.pdf.

(4) Farmer J, McLeod L, Siddiqi A, Ravaghi V, Quiñonez C. Towards an understanding of the structural determinants of oral health inequalities: A comparative analysis between Canada and the United States. SSM - Population Health. 2016 Dec;2:226-36.

(5) Canadian Institute for Health Information. National Health Expenditure Trends, 1975 to 2014 [Internet]. Ottawa, ON: Canadian Institute for Health Information; 2014 Available from: https://www.cihi.ca/en/nhex_2014_report_en.pdf.

(6) Canadian Dental Association. [Internet]. Canadian Dental Association; The State of Oral Health in Canada: Dental health services in Canada [updated 2017 March, 2017; cited 22 November, 2017]; [about 3 screens]. Available from: https://www.cda-adc.ca/stateoforalhealth/servicescanada/.

(7) Van Lancker A, Verhaeghe S, Van Hecke A, Vanderwee K, Goossens J, Beeckman D. The association between malnutrition and oral health status in elderly in long-term care facilities: a systematic review. Int J Nurs Stud. 2012 Dec;49(12):1568-81.

(8) Naito M, Yuasa H, Nomura Y, Nakayama T, Hamajima N, Hanada N. Oral health status and health-related quality of life: a systematic review. J Oral Sci. 2006 Jan;48(1):1-7.

(9) Bortoluzzi MC, Traebert J, Lasta R, Da Rosa TN, Capella DL, Presta AA. Tooth loss, chewing ability and quality of life. Contemp Clin Dent. 2012 Oct;3(4):393-7.

(10) Irwin L, Siddiqi A and Hertzman C. Early child development: a powerful equalizer. World Health Organization; 2007 [cited 16 November, 2017].

(11) World Health Organization. [Internet]. Early child development [updated 2011 Available from: http://www.who.int/maternal_child_adolescent/topics/child/development/en/.

(12) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(13) First Nations Information Governance Centre (FNIGC). Report on the Findings of the First Nations Oral Health Survey (FNOHS) 2009-10. Ottawa: The First Nations Information Governance Centre; 2012 [cited 22 November, 2017].

(14) Statistics Canada. [Internet]. Scholars Portal: A Service of the Ontario Council of University Libraries: Odesi; Canadian Community Health Survey: Annual Component.[updated 2014 Available from: http://odesi2.scholarsportal.info/webview/index.jsp?object=http://142.150.190.128:80%2Fobj%2FfStudy%2Fcchs-82M0013-E-2014-Annual-component&mode=documentation&v=2&top=yes.

(15) Bhatti T, Rana ZF, Grootendorst P. Dental insurance, income and the use of dental care in Canada. Journal (Canadian Dental Association) JID - 7907605 0227.

(16) Locker D, Maggirias J, Quiñonez C. Income, dental insurance coverage, and financial barriers to dental care among Canadian adults. J Public Health Dent. 2011;71(4):327-34.

(17) Thompson B. Cost barriers to dental care in Canada. 2012.

(18) Health Canada. Summary report Inuit oral health survey 2008-2009 [Internet]. Ottawa, ON: Health Canada; 2011 Available from: http://publications.gc.ca/collections/collection_2011/sc-hc/H34-231-2-2011-eng.pdf.

(19) Ghiabi E, Matthews DC, Brillant MS. The oral health status of recent immigrants and refugees in Nova Scotia, Canada. Journal of immigrant and minority health. 2014;16(1):95-101.

(20) Chen J, Wilkins R, Ng E. Health expectancy by immigrant status, 1986 and 1991. Health Reports-Statistics Canada. 1996;8:29-38.

(21) Ravaghi V, Quiñonez C, Allison PJ. The magnitude of oral health inequalities in Canada: findings of the Canadian health measures survey. Community Dent Oral Epidemiol. 2013;41(6):490-8.

(22) Fuller E, Steele J, Watt R and Nuttall N. 1: Oral health and function – a report from the Adult Dental Health Survey 2009. The Health and Social Care Information Centre; 2011 [cited 22 November, 2017].

(23) Watt RG. From victim blaming to upstream action: tackling the social determinants of oral health inequalities. Community Dent Oral Epidemiol. 2007;35(1):1-11.

(24) Ravaghi V, Quiñonez C, Allison PJ. The magnitude of oral health inequalities in Canada: findings of the Canadian health measures survey. Community Dent Oral Epidemiol. 2013 Feb;41(6):490-8.

(25) Centers for Disease Control and Prevention (CDC). [Internet]. Division of Oral Health, National Center for Chronic Disease Prevention and Health Promotion; May 17, 2016. Disparities in Oral Health [updated 2016 June 8; Available from: http://www.cdc.gov/oralhealth/oral_health_disparities/index.htm.

(26) Sanders AE. Social Determinants of Oral Health: conditions linked to socioeconomic inequalities in oral health in the Australian population [Internet]. Canberra: Australian Institute of Health and Welfare (Media and Publishing Unit); 2007 Available from: http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=60129546502.

(27) New Zealand Ministry of Health. Our Oral Health: Key findings of the 2009 New Zealand Oral Health Survey [Internet]. Wellington: Ministry of Health; 2010 Available from: http://www.health.govt.nz/system/files/documents/publications/our-oral-health-2010.pdf.

(28) Federal, Provincial, Territorial Dental Director's working group (FPTDWG). Reducing Dental Disease: A Canadian Oral Health Framework [Internet]. 2013 Available from: http://www.caphd.ca/sites/default/files/FrameworkOctober%202014%20-%20FINAL%20English.pdf.

(29) Armour B, Swanson M, Waldman H, Perlman S. A profile of state-level differences in the oral health of people with and without disabilities, in the US, in 2004. Public Health Rep. 2008 Feb;123(1):67-75.

(30) Sheiham A. Oral health, general health and quality of life. Bull World Health Organ. 2005 Sept;83(9):644.

(31) Williams S, Jamieson L, MacRae A, Gray C. Review of Indigenous oral health. Oral Health. 2011;11(2):1-8.

(32) National Collaborating Centre for Aboriginal Health. [Internet]. Prince George, BC: NCCAH; Access to health services as a social determinant of First Nations, Inuit and Métis health [updated 2009 cited 22 November, 2017]; [about 6 screens]. Available from: https://www.ccnsa-nccah.ca/495/Access_to_health_services_as_a_social_determinant_of_First_Nations,_Inuit_and_M%C3%A9tis_health.nccah?id=22.

(33) First Nations Health Authority. Healthy smiles for life: BC's First Nations and Aboriginal Oral Health Strategy. 2014 [cited 22 November, 2017].

(34) Human Rights Watch. Make it Safe: Canada's Obligation to End the First Nations Water Crisis. 2016 [cited 17 November, 2017].

(35) Earle L. Traditional aboriginal diets and health. : National Collaborating Centre for Aboriginal Health/Centre de collaboration nationale de la santé autochtone; 2011.

(36) Health Canada. [Internet]. Diseases and health conditions - First Nations and Inuit Health [updated 2012 cited 15 February, 2013]; Available from: from http://www.hc-sc. gc.ca/fniah-spnia/diseases-maladies/index-eng.php.

(37) Chaffee B, Gansky S, Weintraub J, Featherstone J, Ramos-Gomez F. Maternal oral bacterial levels predict early childhood caries development. J Dent Res. 2014;93(3):238-44.

(38) Cidro J, Zahayko L, Lawrence HP, Folster S, McGregor M, McKay K. Breast feeding practices as cultural interventions for early childhood caries in Cree communities. BMC oral health. 2015;15(1):49.

(39) Lawrence H, Nahwegahbow A. Role of Indigenous mothers in infant oral care. 2017 March 31-April 2, 2017.

(40) Silk H, Douglass AB, Douglass JM, Silk L. Oral health during pregnancy. Am Fam Physician. 2008;77(8).

(41) Ponti M. Special considerations for the health supervision of children and youth in foster care. Paediatriatric Children's Health. 2008;13:129-32.

(42) Health Canada. Non-Insured Health Benefits Program - First Nations and Inuit Health Branch: Annual Report 2014/2015 [Internet]. Ottawa, ON: Health Canada; 2016 Available from: https://www.canada.ca/en/health-canada/services/publications/health-system-services/non-insured-health-benefits-program-first-nations-inuit-health-branch-annual-report-2014-2015.html.

(43) Public Health Agency of Canada, Pan-Canadian Public Health Network, Statistics Canada and Canadian Institute for Health Information. [Internet]. 2017-09-13. Pan-Canadian Health Inequalities Data Tool [updated 2017 Available from: http://odesi2.scholarsportal.info/webview/index.jsp?object=http://142.150.190.128:80%2Fobj%2FfStudy%2Fcchs-82M0013-E-2014-Annual-component&mode=documentation&v=2&top=yes.

INEQUALITIES IN
TUBERCULOSIS IN CANADA

INEQUALITIES HIGHLIGHTS

- Although the incidence of active tuberculosis disease in the overall Canadian population is among the lowest in the world, high rates persist among Indigenous peoples and foreign-born people.
- The tuberculosis incidence rate among Inuit, First Nations, and Métis people is, respectively, 293.8, 32.0, and 6.5 times higher than the rate among Canadian-born non-Indigenous people. This means there are, respectively, 196.9, 20.9, and 3.7 more tuberculosis cases per 100 000 population among Inuit, First Nations, and Métis people.
- The tuberculosis rate among foreign-born people is 20.6 times the rate of Canadian-born non-Indigenous people. This represents approximately 13 more tuberculosis cases per 100 000 among foreign-born people compared with Canadian-born non-Indigenous people.

ACRONYM	FULL NAME
AIDS	Acquired Immune Deficiency Syndrome
CTBRS	Canadian Tuberculosis Reporting System
HIV	Human Immunodeficiency Virus
INAC	Indigenous and Northern Affairs Canada
LTBI	Latent Tuberculosis Infection
PHAC	Public Health Agency of Canada
WHO	World Health Organization

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Tuberculosis is an infectious disease caused by the bacteria *Mycobacterium tuberculosis*. It usually attacks the lungs, but can also affect other parts of the body, including lymph nodes, kidneys, the urinary tract, and bones. When *M. tuberculosis* enters the lungs, the immune system tries to either kill or contain the bacteria. A person who has been infected with *M. tuberculosis* that remains contained or inactive in the body is said to have latent tuberculosis infection (LTBI); the infection does not make a person feel sick and cannot be spread to others (1). LTBI can, however, become active at any time, and the risk of activation is highest in the first 2 years following infection. The risk of progressing to active tuberculosis disease is also increased in people who have diseases or conditions that weaken the immune system, such as Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS). In Canada, approximately 1 600 cases of active tuberculosis disease are reported annually (1).

Despite prevention and control efforts, tuberculosis remains a major international health problem. The World Health Organization (WHO) estimated that there were 10.4 million incident cases of tuberculosis worldwide in 2015, or a rate of 142 cases per 100 000 population (2). In the same year, tuberculosis killed 1.8 million people, 22% of whom were co-infected with HIV. Asia had the largest number of incident cases worldwide (61%); 45% of new global cases were from just three countries: India, Indonesia, and China (2).

Tuberculosis used to be a major cause of morbidity and mortality in Canada. In 1926, about one in 13 deaths in Canada was attributed to tuberculosis, more than those who died from cancer (3). In the late nineteenth century, epidemics of tuberculosis that occurred in First Nations populations in Western Canada due to famine and overcrowding resulted in peak tuberculosis mortality rates 6 times the highest rates recorded in Europe (4). Tuberculosis continues to remain a health concern among some Indigenous peoples in Canada.

Improvements in general living conditions, combined with public health actions, resulted in massive declines in the incidence of and mortality from tuberculosis in Canada in the last century (5). However, after decades of decline, rates among Status First Nations peoples have plateaued (6), while rates among Inuit increased from the late 1990s until 2010 (7).

Currently, populations in Canada at increased risk for tuberculosis exposure and LTBI include Indigenous peoples, immigrants to Canada born in countries with a high tuberculosis incidence, people experiencing homelessness, residents of correctional facilities or long-term care facilities, health care workers, and people who inject drugs or who have other behavioural risk factors and comorbidities (8).

Foreign-born Canadians make up approximately 20% of the total Canadian population. The Government of Canada requires that people applying for permanent residency and, on occasion, temporary residency undergo a medical examination prior to their arrival. This medical examination includes a mandatory chest X-ray to screen for active tuberculosis in people 11 years of age and older (8,9). Anyone found to have active tuberculosis is required to complete a course of treatment before being allowed to enter Canada. Proof of successful treatment completion, stable and/or improving chest X-rays, and three negative sputum smears and cultures must be provided. Those with previously treated tuberculosis or who have an abnormal chest X-ray but without active tuberculosis disease undergo tuberculosis surveillance after arrival (8). Of the foreign-born people with tuberculosis who arrived in Canada between 2000 and 2010, almost 50% were diagnosed with active tuberculosis within the first 5 years of their arrival (10).

The risk of tuberculosis infection increases with malnutrition, cigarette smoking, and crowded housing, which reflect social and economic disparities (7). Factors associated with the progression from LTBI to active disease include diabetes, chronic renal failure, immune-compromised states, and/or being a drug user (11).

Poor treatment adherence (treatment takes 6 to 9 months) is the most common cause of initial treatment failure and of disease relapse, which can contribute to disease transmission (12). In Indigenous populations, barriers to treatment adherence include acute and public health system factors, chronic diseases such as HIV and diabetes, and social determinants of health such as poverty and social stigma (12).

Tuberculosis was selected as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter.)

METHODS

The Canadian Tuberculosis Reporting System (CTBRS) is a national case-based surveillance system through which the Public Health Agency of Canada (PHAC) monitors cases of active tuberculosis disease diagnosed in Canada. The CTBRS is a collaborative effort with the provincial and territorial ministries of health. In short, provincial and territorial public health authorities voluntarily submit reports on all new and re-treatment cases of active tuberculosis[38]. [See details on the CTBRS's methods.]

The CTBRS collects data on demographic factors (sex, age, origin, province or territory of residence, immigration status), risk factors (e.g. HIV status and substance abuse), treatment regimen, and treatment outcome. "First Nations" refers to those formerly known as North American Indians and includes those with and without Status where Status refers to those registered according to the terms of the *Indian Act* (13).

Data on active tuberculosis cases collected through the CTBRS and used for this report covered the period from 2010 to 2014.

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Six inequality measures were calculated to assess the size and impact of inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable fraction, population attributable rate, and population impact number.

This report provides measures of health inequalities based on the annual surveillance of tuberculosis by CTBRS. Together, CTBRS and this report provide a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected according to the assumption that this group has the greatest social advantage in the Canadian context. (For more detailed information, see the Methodology chapter.)

Findings

Significant inequalities in tuberculosis rates were observed among Indigenous and foreign-born people for the period from 2010 to 2014, as described below. (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Sex/Gender

The incidence rate of tuberculosis per 100 000 population was 30% higher among males (5.2) than females (4.1). If males had the same incidence rate as females, there would be 198 fewer cases of tuberculosis a year and the rate of new cases of tuberculosis in Canada would be reduced by 12.2% (Figure 1).

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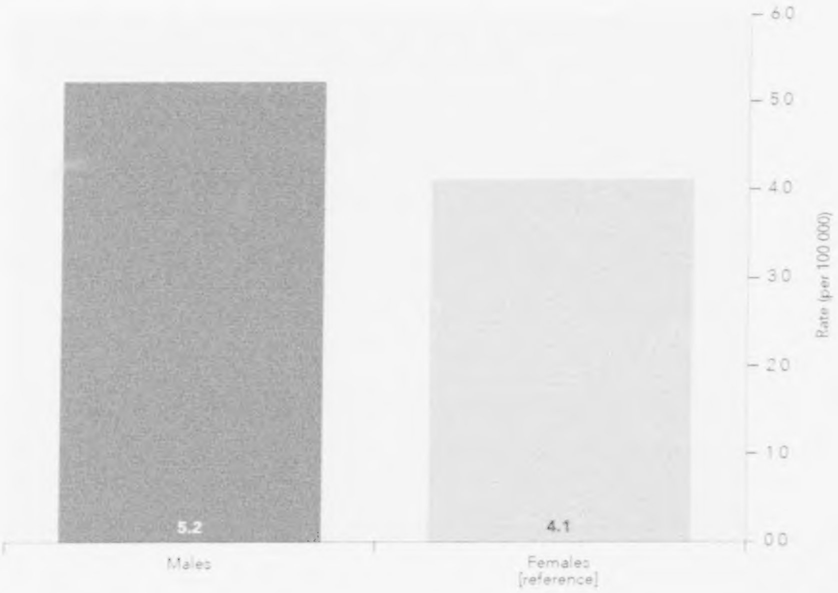
[38] Further details about the CTBRS and how rates were calculated can be obtained from Gallant V, Duvvuri V, McGuire M. Tuberculosis in Canada: 2015 Supplementary data. Can Commun Dis Rep [Internet]. 2017 [cited 2017 April 21];43(3). Available at: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/17vol43/dr-rm43-3-4/ar-05-eng.php.

FIGURE 1

Reported Active (new and retreatment) Tuberculosis Incidence Rates by Sex/Gender, Canada, 2010–2014



	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
Males	1.3	1.1	21.9	12.2	0.6	198
Females [reference]	1.0	0.0	0.0	0.0	0.0	0

Source: Canadian Tuberculosis Reporting System (2010–2014)

Indigenous Peoples

The incidence rates of tuberculosis among all Indigenous groups were higher than among non-Indigenous Canadians. The tuberculosis incidence rate among Inuit (197.6 per 100 000 population) was the highest, at 293.8 times the rate among the Canadian-born non-Indigenous population (0.7 per 100 000 population). The rate among First Nations people (21.5 per 100 000) was 32 times that of Canadian-born non-Indigenous people. The rate among Métis (4.4 per 100 000) was 6.5 times that of Canadian-born non-Indigenous people. The rate among First Nations living on reserve (23.0 per 100 000) was 48% higher than among those living off reserve (15.5 per 100 000 population) (Figure 2).

If First Nations, Inuit, and Métis had the same tuberculosis rate as Canadian-born non-Indigenous people, 185, 117, and 16 cases of tuberculosis, respectively, would be avoided each year.

Foreign-born Status

Foreign-born people accounted for more than two-thirds of new cases of tuberculosis reported in Canada. The tuberculosis incidence rate among foreign-born people was 20.6 times the rate among Canadian-born non-Indigenous people. This represents approximately 13 more tuberculosis cases per 100 000 population among foreign-born people than among Canadian-born non-Indigenous people (Figure 3).

If foreign-born individuals had the same rate of tuberculosis as Canadian-born non-Indigenous people, there would be 1 043 fewer new cases in Canada annually. The overall rate of tuberculosis would also be reduced by 65.3%.

If the rate of tuberculosis among Canadian-born non-Indigenous people and foreign-born Canadians was the same, there would be 1 043 fewer cases annually.

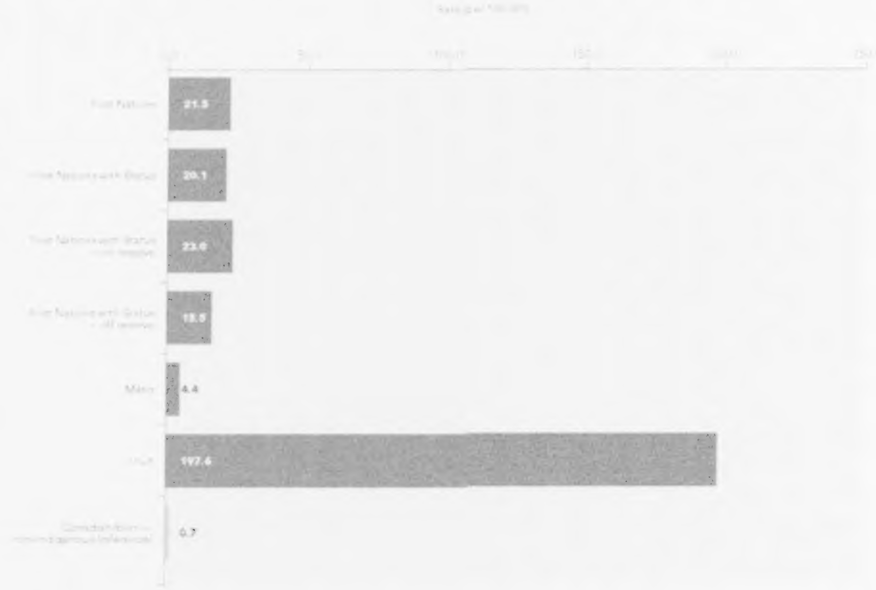
DATA GAPS/LIMITATIONS

The Canadian Tuberculosis Reporting System (CTBRS) was not designed to capture most of the variables of health inequality, such as income, education, rural/urban residence, cultural/racial background, employment and occupation status, and sexual orientation.

Data in the CTBRS were compiled from provincial and territorial sources. These sources may not have always been consistent in how data were collected for First Nations without Status and Métis people. Although non-Status First Nations people make up about 25% of the First Nations population (14), the CTBRS recorded almost no cases of tuberculosis among non-Status First Nations people (10). This suggests that non-Status First Nations people with tuberculosis may have been categorized as either First Nations with Status or as Métis.

FIGURE 2

Reported Active (new and retreatment) Tuberculosis Incidence Rates by Indigenous Identity, Canada, 2010–2014

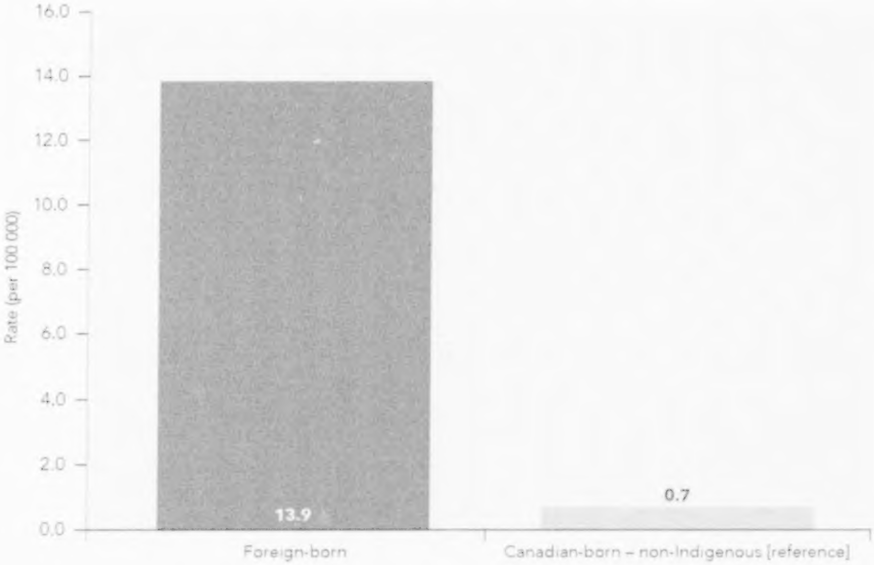


	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
First Nations	32.0	20.9	96.9	37.1	0.7	185
First Nations with Status	29.8	19.4	96.6	36.2	0.7	181
First Nations with Status – on reserve	34.3	22.4	97.1	22.1	0.4	110
First Nations with Status – off reserve	23.1	14.8	95.7	13.1	0.2	65
Métis	6.5	3.7	84.6	3.2	0.1	16
Inuit	293.8	196.9	99.7	23.5	0.4	117
Canadian-born – non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0

Source: Canadian Tuberculosis Reporting System (2010–2014)

FIGURE 3

Reported Active (new and retreatment) Tuberculosis Incidence Rates by Foreign-born Status, Canada, 2010–2014



	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
Foreign-born	20.6	13.2	95.1	65.3	3.0	1 043
Canadian-born – non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0

Source: Canadian Tuberculosis Reporting System (2010–2014)

Two data sources were used to determine Indigenous populations. The First Nations (total) and Métis population data came from Statistics Canada, whereas population estimates/projections for First Nations with Status, on and off reserve, were prepared by Indigenous and Northern Affairs Canada (INAC). The INAC-tabulated counts of First Nations on and off reserve populations were greater than the total count tabulated by Statistics Canada. As such, there may be inconsistencies in First Nations population estimates.

In this report, we examine inequalities for each social category (e.g. sex/gender, Indigenous identity) separately. The magnitude of inequalities associated with multiple and intersecting identities is not captured here. Furthermore, the generalization of findings in broad population groups, such as foreign-born and Indigenous Canadians, masks the heterogeneity of incidence rate and risk factors within these groups resulting from differences in the lived experiences in these populations; this can lead to an over- or underestimation of the health burden that subpopulations of these groups face. For example, 2010 tuberculosis rates among Indigenous peoples in Manitoba and Saskatchewan were more than 10 times the rates among Indigenous peoples in Ontario (10). A similar variability in risk of tuberculosis was noted among immigrants to Canada according to their country of origin, with much higher rates among those from Africa, South Asia, and East Asia than among those from Europe (10). The disproportionate burden of tuberculosis these groups experience is driven by a complex system of social determinants of health that remains to be fully explored and understood.

Finally, while the foreign-born and Canadian Indigenous populations remain at highest risk for active tuberculosis, incidence may be increasing in other populations, particularly among people experiencing homelessness or substance users. Data on these populations are often not available.

DISCUSSION

Consistent with the overall global trend (2), our findings show a higher incidence rate of tuberculosis among males than females (5.2 versus 4.1 per 100 000). Behavioural and physiological differences might explain the higher incidence rate among men (15). For example, smoking is a risk factor for tuberculosis and more men than women are smokers (15). Biological differences between the sexes, such as the effect of hormones on the function of immune cells, may influence susceptibility to tuberculosis (15,16).

The rate of tuberculosis among Inuit, First Nations, and Métis was 197.6, 21.5, and 4.4 per 100 000 people, respectively. The increased risk of tuberculosis among Indigenous people reflects both the direct and indirect results of a history of colonialism and loss of lands, and the consequence of the cultural, economic, and social disenfranchisement that ensued (5). Historically, Inuit with active tuberculosis disease were often transferred south for treatment. These practices have adversely affected Indigenous communities and the social acceptance of prevention and treatment programs (5). In addition, the creation of trade and work relationships with European settlers, as well as the establishment of the reserve system, often with inadequate housing and living conditions, have also increased the risk factors for tuberculosis (17). Other conditions such as diabetes, malnutrition, end-stage renal disease, and HIV infection, which are risk factors for progression from LTBI to active tuberculosis disease, are more prevalent or are becoming more prevalent in some Indigenous populations compared with non-Indigenous population groups (5,7).

Higher tuberculosis incidence rates in First Nations communities have been linked to overcrowded living conditions (18) and food insecurity (7). Poor housing conditions as a result of poverty and/or social deprivation with limited health care access can also increase risk factors for tuberculosis (7). Tuberculosis incidence in First Nations people has been reported to be higher in isolated First Nations communities. This may reflect inadequate resources, including fewer health care professionals and limited diagnostic services, in these communities, as well as the challenge in transporting patients over longer distances (7).

An increased risk of tuberculosis among Indigenous people has been reported in other countries, but at rates lower than in Canada. The incidence of tuberculosis among the Australian-born Indigenous population in 2013 was 4.6 per 100 000, which was about 6 times that of Australian-born non-Indigenous people (19). In 2016, the tuberculosis rate among American Indians and Alaskan Natives was 5.0 per 100 000, or 4.7 times the population born in the United States of America (20). Historically, tuberculosis rates among Canadian Inuit and Alaska Natives were comparable; trends diverged in the late 1990s, with rates among Inuit in Canada now 6 times those among Alaska Natives (21).

The tuberculosis incidence rate in the foreign-born population in Canada was 20.6 times that of the Canadian-born non-Indigenous population. As in other higher-income countries, most new cases of tuberculosis in Canada occurred among people born in countries with a high burden of tuberculosis (22,23). The rate among foreign-born individuals reflects the rates in the countries from which they emigrated. Rates were highest for people from Africa (particularly countries with high HIV prevalence), the Western Pacific, and Southeast Asia (10).

In the United States, the highest number of tuberculosis cases were also among foreign-born individuals—15.1 cases per 100 000, which was roughly 13 times the number in the USA-born population (1.2 cases per 100 000) (20). Australia's overseas-born population had an incidence rate of 18.4 per 100 000, which was over 19 times the rate in the Australian-born population (19).

An estimated 20% to 50% of active tuberculosis cases among Canadian immigrants are the result of recent return travel to their country of origin (8). Another reason for the high burden of tuberculosis in the foreign-born population is the reactivation of remotely acquired LTBI (23). Similarly, the most frequently reported risk factor among overseas-born people in Australia in 2013 was "past travel to or residence in a high-risk country" (19). In the United States, about 90% of tuberculosis cases in foreign-born people can be attributed to reactivation of imported infection (20).

Screening for and treating LTBI among Canadian immigrants from high-risk countries has been recommended (24). Others have suggested that the focus should be on the social determinants of health, such as the higher rates of poverty among immigrants (25).

Although tuberculosis is both preventable and curable, rates have remained high among some foreign-born and Indigenous people in Canada. Tuberculosis has long been described as a social disease, highlighting the importance of the role of the social determinants of health. While there are some individual risk factors, including smoking and sex/gender, these are greatly impacted by socioeconomic status, including living conditions, food insecurity, and access to health care. The systematic and expanded measurement of health inequalities of Canadians with tuberculosis will help to inform and strengthen interventions to reduce the revealed differences and related impacts. Addressing these highlighted inequalities through policy interventions that can impact the broader influences of poverty and social deprivation will require ongoing political will, adequate funding, community mobilization, and scientific resources (26). Further understanding of the role of the social determinants of health in tuberculosis will require the continued monitoring of tuberculosis inequalities across sociodemographic and socioeconomic groups to identify how these are changing over time to inform programs, policies, and research.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Tuberculosis. Data Source: Canadian Tuberculosis Reporting System (2010–2014)

			INEQUALITY MEASURES			POPULATION IMPACT MEASURES		
Social Stratifiers		Rate (per 100 000)	Rate Ratio (RR)	Rate Difference (RD) per 100 000	Attributable Fraction (AF%)	Population Attributable Fraction (PAF)	Population Attributable Rate (PAR) per 100 000	Population Impact Number (PIN) per year
Overall	Both Sexes	4.6		NA			NA	
Population Groups								
Sex/gender	Male	5.2	1.3	1.1	21.9	12.2	0.6	198
	Female [reference]	4.1	Reference					
Indigenous identity	First Nations	21.5	32.0	20.9	96.9	37.1	0.7	185
	First Nations with Status	20.1	29.8	19.4	96.6	36.2	0.7	181
	First Nations with Status – on reserve	23.0	34.3	22.4	97.1	22.1	0.4	110
	First Nations with Status – off reserve	15.5	23.1	14.8	95.7	13.1	0.2	65
	Métis	4.4	6.5	3.7	84.6	3.2	0.1	16
	Inuit	197.6	293.8	196.9	99.7	23.5	0.4	117
	Canadian-born – non-Indigenous [reference]	0.7	Reference					
	Total Indigenous	23.7	35.2	23.0	97.2	20.0	0.9	319
Foreign-born status	Foreign-born	13.9	20.6	13.2	95.1	65.3	3.0	1,043
	Canadian-born – non-Indigenous [reference]	0.7	Reference					

NOTE:

The purpose of the colour scaling is to map (for all indicators and stratifiers) 1- the relative and absolute inequalities; 2- the patterns of inequalities (e.g. Indigenous populations frequently experience inequalities compared to non-Indigenous); 3- the gradients of inequalities (e.g. there are frequently inequalities in a gradient across income strata). The magnitude and distribution of inequalities shown in this table should be interpreted with caution, taking into consideration one indicator at a time, the differences among the data sources used (e.g. survey vs. administrative register), and existing limitations in the measurement of the social statifiers.

Colour scaling for rate ratios below 1 and rate differences below 0 was applied using the reciprocal value and the absolute value respectively. For example, for a RR of 0.5, the colour scale applied is for the value 2.0 (1/0.5) and for a RD of -10, the colour scale for the value 10 is used. Colour scaling is only applied when the difference between the value and the reference group is statistically significant.

LEGEND

		RR	RD per 100 000		
Non-applicable	NA	> 1.8	> 930	■	Larger Inequality
Non-reportable	F	1.5 → 1.8	280 → 930	■	↑
Report with Caution	E	1.3 → 1.5	120 → 280	■	↕
Statistically Significant	*	1.2 → 1.3	60 → 120	■	↓
Reference	▨	1.1 → 1.2	30 → 60	■	Smaller Inequality
		1.0 → 1.1	0 → 30	□	

References

(1) Government of Canada. [Internet]. Ottawa: Government of Canada; 2016. Causes of tuberculosis (TB) [updated 2016 Mar 24; cited 2017 Apr 25]; [about 1 screens]. Available from: https://www.canada.ca/en/public-health/services/diseases/tuberculosis-tb/causes-tuberculosis-tb.html.

(2) World Health Organization. Global tuberculosis report 2016 [Internet]. Geneva: World Health Organization; 2016 [cited 2017 Apr 18]. Available from: http://www.who.int/tb/publications/global_report/en/.

(3) Brancker A, Enarson DA, Grzybowski S, Hershfield ES, Jeanes CW. A statistical chronicle of tuberculosis in Canada: Part I. From the era of sanatorium treatment to the present. Health Rep. 1992;4(2):103-23.

(4) Ackley SF, Liu F, Porco TC, Pepperell CS. Modeling historical tuberculosis epidemics among Canadian First Nations: effects of malnutrition and genetic variation. PeerJ. 2015;3:e1237.

(5) Public Health Agency of Canada. The Chief Public Health Officer's report on the state of public health, 2013. Infectious disease - the never-ending threat. Tuberculosis - past and present [Internet]. Ottawa: Public Health Agency of Canada; 2013 [cited 2017 Apr 21]. Available from: http://www.phac-aspc.gc.ca/cphorsphc-respcacsp/2013/tuber-eng.php.

(6) Long R, Hoeppner V, Orr P, Ainslie M, King M, Abonyi S, et al. Marked disparity in the epidemiology of tuberculosis among Aboriginal peoples on the Canadian Prairies: The challenges and opportunities. Canadian respiratory journal. 2013;20(4):223-30.

(7) Alvarez GG, Orr P, Wobeser WL, Cook V, Long R. Chapter 14 Tuberculosis prevention and care in First Nations, Inuit and Metis peoples. Canadian Tuberculosis Standards. 7th ed. Ottawa: Public Health Agency of Canada/ Canadian Thoracic Society; 2013. p. 345-360.

(8) Greenway C, Khan K, Schwartzman K. Chapter 13 Tuberculosis surveillance and screening in selected high-risk populations. In: Centre for Communicable Diseases and Infection Control, editor. Canadian Tuberculosis Standards. 7th ed. Ottawa: Public Health Agency of Canada; 2014. p. 321-344.

(9) Immigration, Refugees and Citizenship Canada. [Internet]. Ottawa: Government of Canada; 2013. Immigration Medical Exam [updated 2013 May 07; cited 2017 Apr 21]; [about 2 screens]. Available from: http://www.cic.gc.ca/english/resources/tools/medic/exam/.

(10) Halverson J, Ellis E, Gallant V, Archibald C. Chapter 1 Epidemiology of tuberculosis in Canada. Canadian Tuberculosis Standards. 7th ed. Ottawa: Public Health Agency of Canada/ Canadian Thoracic Society; 2014. p. 2-18.

(11) Centers for Disease Control and Prevention. Latent tuberculosis infection: A guide for primary heatlh care providers [Internet]. Atlanta: Centers for Disease Control and Prevention, National Center for HIV/AIDS, Viral Hepatits, STD, and TB prevention; 2013 [cited 2017 Apr 21]. Available from: https://www.cdc.gov/tb/publications/ltbi/pdf/targetedltbi.pdf.

(12) Orr P. Adherence to tuberculosis care in Canadian Aboriginal populations Part 1: definition, measurement, responsibility, barriers. Int J Circumpolar Health. 2011;70(2):113-27.

(13) Government of Canada. [Internet]. Ottawa: Juctice Laws Website; 2015. Indian Act (R.S.C, 1985, c. I-5) [updated 2017 Oct 10; cited 2017 Apr 25]; [about 2 screens]. Available from: http://laws-lois.justice.gc.ca/eng/acts/i-5/.

(14) Statistics Canada. [Internet]. Ottawa: Statistics Canada; 2013. Aboriginal Peoples in Canada: First Nations People, Métis and Inuit [updated 2016 Sep 15; cited 2017 Apr 21]; [about 20 screens]. Available from: http://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-011-x/99-011-x2011001-eng.cfm.

(15) Nhamoyebonde S, Leslie A. Biological differences between the sexes and susceptibility to tuberculosis. J Infect Dis. 2014;209(suppl_3):S100-6.

(16) Neyrolles O, Quintana-Murci L. Sexual inequality in tuberculosis. PLoS medicine. 2009;6(12):e1000199.

(17) Grzybowski S, Allen EA. Tuberculosis: 2. History of the disease in Canada. CMAJ. 1999 Apr 6;160(7):1025-8.

(18) Larcombe L, Nickerson P, Singer M, Robson R, Dantouze J, McKay L, et al. Housing conditions in 2 Canadian first nations communities. Int J Circumpolar Health. 2011;70(2):141-53.

(19) Toms C, Stapledon R, Waring J, Douglas P, National Tuberculosis Advisory Committee, for the Communicable Diseases Network Australia, and the Australian Mycobacterium Reference Laboratory Network. Tuberculosis notifications in Australia, 2012 and 2013. Commun Dis Intell Q Rep. 2015 Jun 30;39(2):E217-35.

(20) Schmit KM. Tuberculosis—United States, 2016. MMWR.Morbidity and Mortality Weekly Report. 2017;66.

(21) Orr P. Tuberculosis in Nunavut: looking back, moving forward. CMAJ. 2013 Mar 5;185(4):287-8.

(22) DeAngelis CD, Flanagin A. Tuberculosis—A global problem requiring a global solution. JAMA. 2005;293(22):2793-4.

(23) Pareek M, Greenaway C, Noori T, Munoz J, Zenner D. The impact of migration on tuberculosis epidemiology and control in high-income countries: a review. BMC medicine. 2016;14(1):48.

(24) Varughese M, Langlois-Klassen D, Long R, Li M. Preventing tuberculosis in the foreign-born population of Canada: a mathematical modelling study. The International Journal of Tuberculosis and Lung Disease. 2014;18(4):405-12.

(25) Reitmanova S, Gustafson D. Rethinking immigrant tuberculosis control in Canada: from medical surveillance to tackling social determinants of health. Journal of immigrant and minority health. 2012;14(1):6-13.

(26) Isaakidis P, Smith S, Majumdar S, Furin J, Reid T. Calling tuberculosis a social disease–an excuse for complacency? Lancet. 2014 Sep 20;384(9948):1095,6736(14)61670-6.

HEALTH DETERMINANTS – DAILY LIVING CONDITIONS

HEALTH BEHAVIOURS

INEQUALITIES IN
HIGH ALCOHOL CONSUMPTION IN CANADA

INEQUALITIES HIGHLIGHTS

- High alcohol consumption, or heavy drinking, is defined as having had 5 or more drinks on one occasion at least once a month over the past year.
- The prevalence of heavy drinking is 2.3 times higher among men than among women. This means that 15.2 more men than women per 100 Canadian adults drink heavily.
- Bisexual or lesbian women report heavy drinking 1.7 and 1.6 times that of heterosexual women whereas these rates are similar among bisexual or gay men and heterosexual men. This means that compared with heterosexual women, 9.9 more bisexual women and 8.9 lesbians, per 100 Canadian women, report high alcohol consumption.
- Heavy drinking is 0.3 times lower among Black, South Asian, East/Southeast Asian, and Arab/West Asian than among White Canadians. This means that, compared with White Canadians, 15 fewer people per 100 reported heavy drinking in each of these population groups.
- People who are permanently unable to work report 0.5 times the heavy drinking of those who have a job. This equates to 11.8 fewer reports of heavy drinking per 100 Canadian adults among those permanently unable to work than among those who have a job.
- The prevalence of heavy drinking among First Nations living off reserve, Métis, and Inuit adults is 1.3, 1.4, and 1.3 times the prevalence among non-Indigenous adults, respectively. This equals 5.2 more First Nations living off reserve, 7.4 more Métis and 5.3 more Inuit reporting heavy drinking, compared to non-Indigenous adults per 100 Canadian adults.
- Heavy drinking is more prevalent with increasing incomes. Canadians with the lowest incomes have a heavy drinking prevalence 0.6 times that of those with the highest incomes. This means that out of 100 Canadian adults, there are 10 fewer reports of heavy drinking in the lowest income group than in the highest income group.
- Heavy drinking among managers and those in skilled, technical, or supervisory occupations is, respectively, 1.3 and 1.4 times the prevalence among those in professional occupations. This means that, per 100 Canadian adults, there are 5.8 more managers and 7.4 more people in skilled, technical, or supervisory occupations with high alcohol consumption.

ACRONYM	FULL NAME
CI	Confidence Interval
CCHS	Canadian Community Health Survey
FAS	Fetal Alcohol Syndrome
FNIGC	First Nations Information Governance Centre
RHS	First Nations Regional Health Survey

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Alcohol plays a role in Canadian society as part of many social events and gatherings. For the most part, Canadians who drink, drink responsibly (1). In 2013, about 22 million Canadians drank alcohol in the previous year. Of these, 3.1 million drank enough to be at risk for immediate harm, while 4.4 million Canadians drank enough to be at risk for chronic health effects (1). Immediate harm to self or others as a result of intoxication includes alcohol poisoning and injuries from domestic violence and car crashes. Longer-term risks include the development of alcoholic liver disease; impaired cognitive ability; various cancers such as colorectal, breast, liver, and oropharyngeal; and cardiovascular diseases, including coronary artery disease, stroke, and heart failure (1). Also, alcohol abuse can be associated with various mental health disorders, including depression (1).

Alcohol is identified as one of the leading risk factors for death and disability for Canadians overall and the leading risk factor for Canadians aged 15 to 49 years (2). Among all psychoactive drugs, alcohol-related disorders were the leading cause of hospitalizations in Canada in 2011 (1). In 2002, alcohol use in Canada was associated with an economic burden of $14.6 billion, including $3.3 billion in direct health care costs, $3.1 billion in law enforcement costs, $7.1 billion in lost productivity, and other costs associated with traffic accidents, workplace damage, and more (3).

The patterns of alcohol consumption and resulting harmful effects are unevenly distributed across the population (4). Factors at the individual level influence patterns of alcohol consumption and consequences, including personality traits, motivations for drinking or not drinking, and coping abilities (1). In turn, these factors are greatly affected by social and physical environments, which include social and cultural norms, loss of cultural identity, stigma related to drinking, social networks and supports, exposure to alcohol marketing, and availability and affordability of alcohol (1). For example, in British Columbia, increases in minimum alcohol prices were associated with reduced alcohol-attributable hospitalizations (5). In contrast, increased access to alcohol retailers was associated with an increase in alcohol-related harms (6).

Other factors such as sex/gender, socioeconomic status, employment type, and level of education affect patterns of alcohol consumption and consequences, and potentially create inequalities in alcohol use and harms (1). Although at the population level, income is positively associated with alcohol consumption, it is inversely associated with the adverse health effects of alcohol. Between 2007 and 2012, the rate of alcohol-attributable hospitalization among Canadians in the lowest income level was approximately 2.4 times the rate among Canadians in the highest income level (7).

High alcohol consumption (heavy drinking) was selected as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter).

METHODS

Data on alcohol consumption and inequalities were collected through the Canadian Community Health Survey (CCHS) from 2010 to 2012. High alcohol consumption was defined as having had 5 or more drinks on one occasion at least once a month over the past year.

The analysis included CCHS respondents aged 18 years and older. Inequalities in high alcohol consumption prevalence were assessed by measuring differences in high alcohol consumption according to social stratifiers grouped under socioeconomic and sociodemographic stratifiers collected through the CCHS. Sociodemographic stratifiers included sex/gender, Indigenous identity, cultural/racial background, immigrant status, sexual orientation (ages 18–59 years[39]), functional health, and rural/urban residence. Socioeconomic stratifiers include income, education (ages 20+ years), occupation (ages 18–75 years), and employment status (ages 18–75 years). Prevalence data were age-standardized using the 2011 Canadian Census of Population.

For the Indigenous identity stratifier, the CCHS sampling frame captures information on Indigenous people who identify as Inuit, Métis, and First Nations living off reserve but excludes First Nations people living on reserve and Inuit in the Quebec region of Nunavik. For First Nations people living on reserve and in northern communities, comparable information is collected by the First Nations Information Governance Centre (FNIGC) and its regional partners through the First Nations Regional Health Survey (RHS). This chapter uses RHS data from 2008 to 2010, for respondents aged 18 years and older, age-standardized using the 2011 Census of Population.

> Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported along with their 95% confidence intervals (CI). Statistical significance was assessed using 95% confidence intervals (8). Sex/gender-specific inequalities for all the social stratifiers were calculated but reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable fraction, population attributable rate, and population impact number. However, due to methodological limitations in combining two datasets (i.e. CCHS and RHS), results for First Nations people living on reserve and in northern communities were not included in the calculation of inequality measures and are reported here in terms of prevalence only.

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[39] The CCHS does not collect data on sexual orientation from individuals over the age of 59 years.

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in the Canadian context. (For more detailed information, see the Methodology chapter.)

FINDINGS

Between 2010 and 2012, 18.9% (95% CI: 18.6–19.2%) of Canadians 18 years and older reported high alcohol consumption over the previous 12 months. For populations grouped by income, employment, immigrant status, and cultural/racial background, a positive association between high alcohol consumption and social advantage was observed. No significant inequalities in heavy drinking were found for functional health (Annex 1). (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Sex/gender

The prevalence of heavy drinking was 26.5% (95% CI: 26.0–27.1%) among men and 11.4% (95% CI: 11.0–11.8%) among women, or 2.3 (95% CI: 2.2–2.4) times greater for men than for women (Figure 1).

If the prevalence of high alcohol consumption among men was the same as that among women, there would be a 57.1% reduction in heavy drinking among men and a 39.5% reduction in the overall national heavy drinking prevalence. This means there would be 1 990 120 fewer heavy drinkers in Canada.

> If men experienced the same prevalence as women, there would be a 57.1% reduction in heavy drinking among men.

Indigenous Peoples

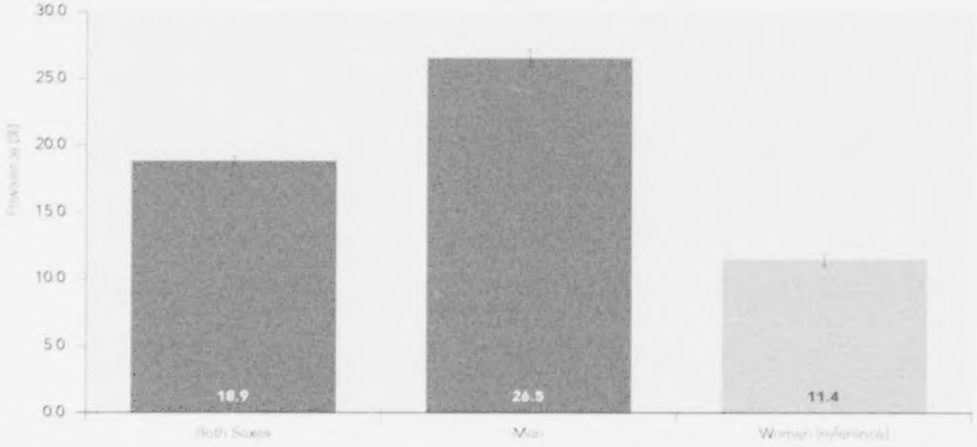
The prevalence of high alcohol consumption among Indigenous adults was greater than the prevalence among non-Indigenous adults. Among First Nations adults living off reserve, the prevalence of heavy drinking was 23.9% (95% CI: 21.6–26.1%). At 1.3 (95% CI: 1.2–1.4) times the prevalence among non-Indigenous adults, this means there were 18.7% (95% CI: 18.3–19.0%), or 5.2 more adults per 100, who engaged in heavy drinking (Figure 2).

If the prevalence of heavy drinking among First Nations adults living off reserve was the same as that among non-Indigenous adults, the prevalence of heavy drinking would be 21.7% (95% CI: 14.1–29.9%) lower among First Nations adults living off reserve. This means there would be 21 310 (95% CI: 11 810–30 820) fewer heavy drinkers in Canada.

The prevalence of heavy drinking among Métis and Inuit was similar to that of First Nations living off reserve, at 26.1% (95% CI: 23.4–28.8%) and 24.0% (95% CI: 18.8–29.3%), respectively.

FIGURE 1

High Alcohol Consumption by Sex/Gender, Canada, ages 18+ years, 2010–2012

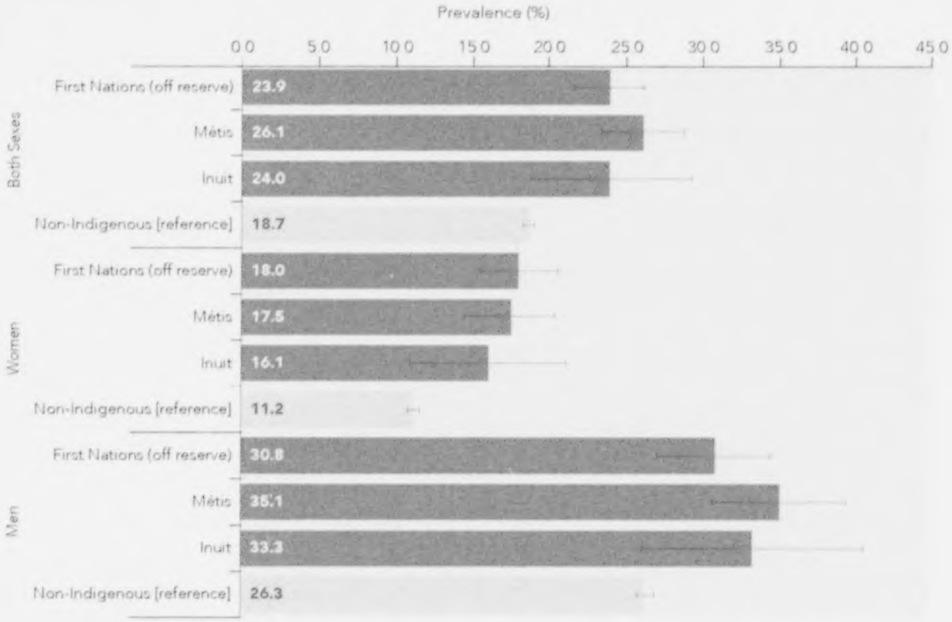


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Men	2.3*	15.2*	57.1*	39.5*	7.4*	1 990 120*
Women [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
High alcohol consumption refers to having 5 or more drinks on one occasion, between once a month to more than once a week over the past year.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2012

FIGURE 2

High Alcohol Consumption by Indigenous Identity and Sex/Gender, Canada, ages 18+ years, 2010–2012



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
First Nations (off reserve)	1.3*	5.2*	21.7*	0.4*	0.1*	21 310*
Métis	1.4*	7.4*	28.3*	0.5*	0.1*	27 470*
Inuit	1.3*	5.3*	22.2*	0.0	0.0	1,550
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
First Nations (off reserve)	1.6*	6.9*	38.1*	1.0*	0.1*	15 120*
Métis	1.6*	6.3*	36.0*	0.8*	0.1*	12 190*
Inuit	1.4	4.9	30.6*	0.0^{E}	0.0^{E}	620^{E}
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
First Nations (off reserve)	1.2*	4.4*	14.4*	0.2*	0.1*	8 520*
Métis	1.3*	8.7*	24.9*	0.4*	0.1*^{E}	15 520*
Inuit	1.3	7.0	20.9*	0.0^{E}	0.0^{E}	1 150^{E}
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0

E: Reportable with caution
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
High alcohol consumption refers to having 5 or more drinks on one occasion, between once a month to more than once a week over the past year.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2012

The inequality in prevalence of heavy drinking by Indigenous identity was more pronounced among women. While First Nations men living off reserve reported a prevalence of 1.2 (95% CI: 1.0–1.3) times that of non-Indigenous men, First Nations women living off reserve reported prevalence of heavy drinking 1.6 (95% CI: 1.4–1.9) times that of non-Indigenous women.

The prevalence of heavy drinking among First Nations living on reserve and in northern communities was 32.3% (95% CI: 31.1–33.5%) (2008–2010 RHS data); among non-Indigenous adults, it was 18.7% (95% CI: 18.3–19.0%) (2010–2012 CCHS data).[40] This inequality is greater for women: the prevalence of heavy drinking among First Nations women living on reserve and in northern communities was 26.4% (95% CI: 24.9–27.9%); among non-Indigenous women, it was 11.2% (95% CI: 10-8-11.6%).

Cultural/Racial Background

Heavy drinking was much more prevalent among White adults, at 21.7% (95% CI: 21.3–22.1%) than among other cultural/racial groups. For example, the heavy drinking prevalence among Black, East/Southeast Asian, South Asian, and Arab/West Asian Canadians ranged between 6.1% and 7.3% (Annex 1). The largest cultural/racial differences were observed between Asian women and White women: fewer than 3.0% of Asian women were heavy drinkers compared with 13.4% of White women. At 14.6% (95% CI: 10.6–18.6%), Latin American adults had a heavy drinking prevalence that was 0.7 (95% CI: 0.5–0.9) times that of White adults. In this population group, the heavy drinking prevalence was 4.7% (95% CI: 2.4–7.0%) among women and 23.3% (95% CI: 16.3–30.3%) among men (Figure 3).

Sexual Orientation (ages 18–59 years)

The prevalence of heavy drinking among adults who identified as bisexual was 1.2 (95% CI: 1.0–1.4) times that of adults who identified as heterosexual (Annex 1).

If the prevalence among bisexual adults was as low as that among heterosexual adults, the heavy drinking prevalence would be 16.2% (95% CI: 3.2–29.3%) lower among bisexual adults. As a result, there would be 9 130 (95% CI: 310–17 960) fewer heavy drinkers in Canada.

The prevalence of heavy drinking among adults who identified as lesbian or gay was 30.2% (95% CI: 26.3–34.1%). This was 1.3 (95% CI: 1.1–1.5) times that of heterosexual adults. If the prevalence in these two populations was equal, the prevalence of heavy drinking would be 22.7% (95% CI: 12.4–33.0%) lower among lesbian or gay adults, and there would be 17 420 (95% CI: 6 950–27 880) fewer heavy drinkers in Canada.

Inequalities in high alcohol consumption by sexual orientation were more pronounced among women than among men. Bisexual or lesbian women reported prevalence of high alcohol consumption as 1.7 (95% CI: 1.3–2.1) and 1.6 (95% CI: 1.2–2.0) times, respectively, that of heterosexual women. Gay or bisexual and heterosexual men had a similar prevalence of heavy drinking.

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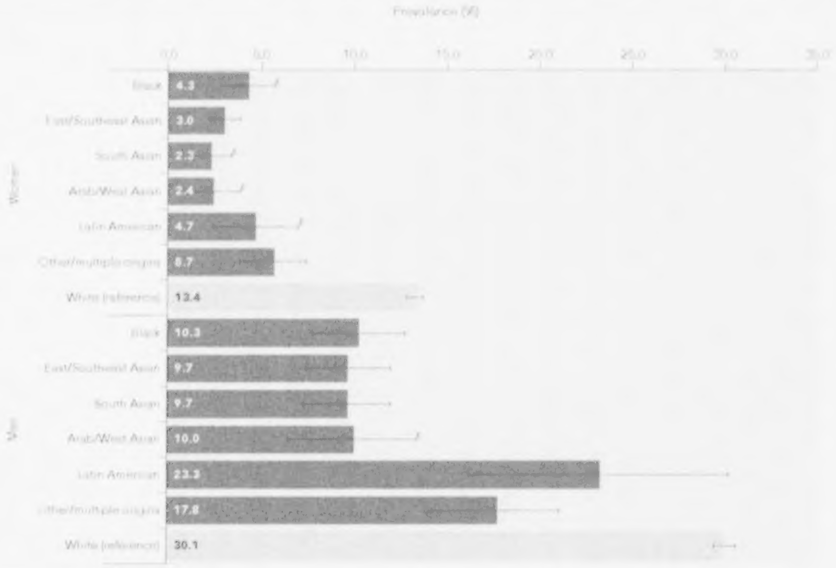
40. RHS prevalence data are presented alongside CCHS data to approximate the magnitude of inequality between First Nations people living on reserve and in northern communities and the non-Indigenous population. Due to methodological limitations, inequality measures were not calculated for the RHS dataset.

FIGURE 3

High Alcohol Consumption by Cultural/Racial Background and Sex/Gender, Canada, ages 18+ years, 2010–2012



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
WOMEN						
Black	0.3*E	−9.1*E	NA	NA	NA	NA
East/Southeast Asian	0.2*	−10.3*	NA	NA	NA	NA
South Asian	0.2*E	−11.0*E	NA	NA	NA	NA
Arab/West Asian	0.2*E	−11.0*E	NA	NA	NA	NA
Latin American	0.4*E	−8.6*E	NA	NA	NA	NA
Other/multiple origins	0.4*	−7.7*	NA	NA	NA	NA
White [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Black	0.3*	−19.8*	NA	NA	NA	NA
East/Southeast Asian	0.3*	−20.4*	NA	NA	NA	NA
South Asian	0.3*	−20.4*	NA	NA	NA	NA
Arab/West Asian	0.3*E	−20.1*E	NA	NA	NA	NA
Latin American	0.8	−6.8	NA	NA	NA	NA
Other/multiple origins	0.6*	−12.3*	NA	NA	NA	NA
White [reference]	1.0	0.0	0.0	0.0	0.0	0

E: Reportable with caution
NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
High alcohol consumption refers to having 5 or more drinks on one occasion, between once a month to more than once a week over the past year.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2012

Immigrant Status

The prevalence of heavy drinking was highest among non-immigrant adults, at 21.9% (95% CI: 21.6–22.3%). Heavy drinking prevalence was lowest among recent immigrants (≤10 years in Canada), at 6.7% (95% CI: 4.9–8.5%). This represents 15.2% fewer heavy drinkers among recent immigrants than among non-immigrant adults (Figure 4). Long-term immigrants (>10 years in Canada) reported a heavy drinking prevalence of 11.0% (95% CI: 10.0–12.0%).

Differences in prevalence of heavy drinking according to immigrant status were more pronounced among women than among men. Only 3.0% (95% CI: 2.1–3.9%) of female recent immigrants reported heavy drinking compared with 13.5% (95% CI: 13.1–14.0%) of non-immigrant women. Among men, 10.8% (95% CI: 7.4–14.3%) of recent immigrants reported heavy drinking compared with 30.4% (95% CI: 29.8–31) of non-immigrants.

Income

The prevalence of heavy drinking increased proportionally with income. Canadians in the highest income quintile had a heavy drinking prevalence of 24.4% (95% CI: 23.7–25.2%) compared with 14.4% (95% CI: 13.7– 15.3%) of Canadians in the lowest income quintile. This represents 10.0 fewer heavy drinkers among those with the lowest incomes than among those with the highest incomes, per 100 Canadian adults (Figure 5).

Education (ages 20+ years)

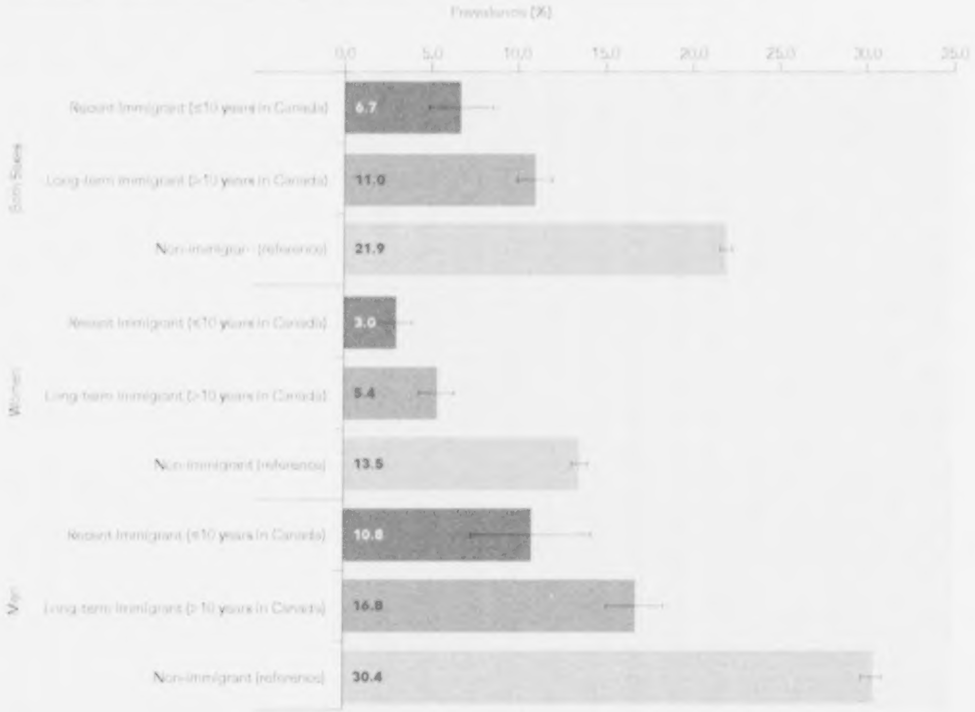
The prevalence of high alcohol consumption was lowest among university graduates, at 14.7% (95% CI: 14.1–15.4%). Heavy drinking prevalence was 20.7% (95% CI: 19.5–21.8%) among those with less than a high school education; 19.3% (95% CI: 18.5–20.2%) among high school graduates; 21.2% (95% CI: 19.7–22.7%) among those with some postsecondary education; and 20.0% (95% CI: 19.4–20.5%) among those with community college/technical school or university certificate training (Figure 6).

Among adults with some postsecondary education, the prevalence of heavy drinking was 1.4 (95% CI: 1.3–1.6) times that of university graduates. If the prevalence of heavy drinking among adults with some postsecondary education and among university graduates was the same, there would be 103 360 (95% CI: 77 180–129 540) fewer heavy drinkers in Canada.

If the prevalence of heavy drinking among adults who did not graduate from university and among university graduates was the same, there would be 1 019 380 fewer heavy drinkers in Canada.

FIGURE 4

High Alcohol Consumption by Immigrant Status and Sex/Gender, Canada, ages 18+ years, 2010–2012

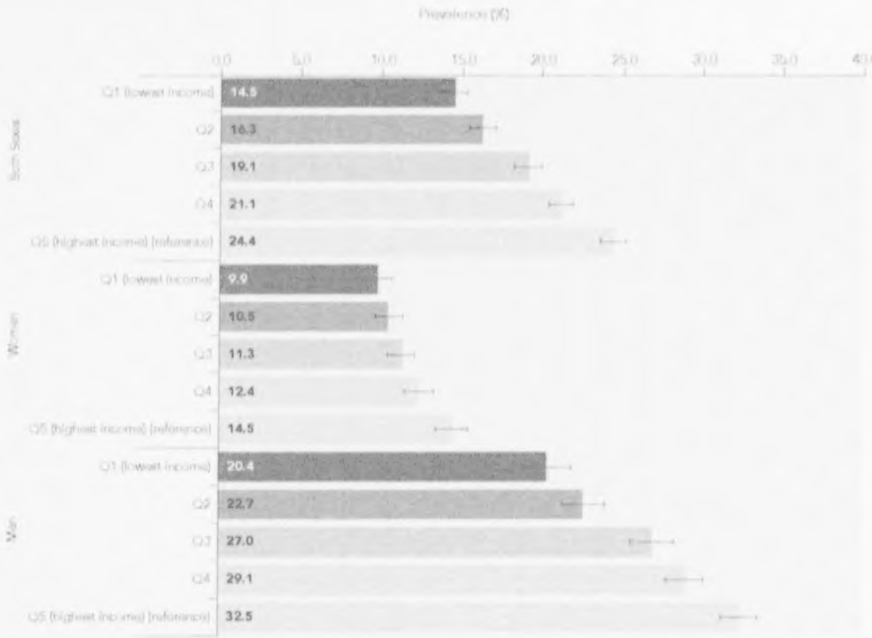


BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Recent Immigrant (≤10 years in Canada)	0.3*	−15.2*	NA	NA	NA	NA
Long-term Immigrant (>10 years in Canada)	0.5*	−10.9	NA	NA	NA	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Recent Immigrant (≤10 years in Canada)	0.2*	−10.6*	NA	NA	NA	NA
Long-term Immigrant (>10 years in Canada)	0.4*	−8.2*	NA	NA	NA	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Recent Immigrant (≤10 years in Canada)	0.4*	−19.6*	NA	NA	NA	NA
Long-term Immigrant (>10 years in Canada)	0.6*	−13.7*	NA	NA	NA	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
High alcohol consumption refers to having 5 or more drinks on one occasion, between once a month to more than once a week over the past year.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2012

FIGURE 5

High Alcohol Consumption by Income Quintile and Sex/Gender, Canada, ages 18+ years, 2010–2012

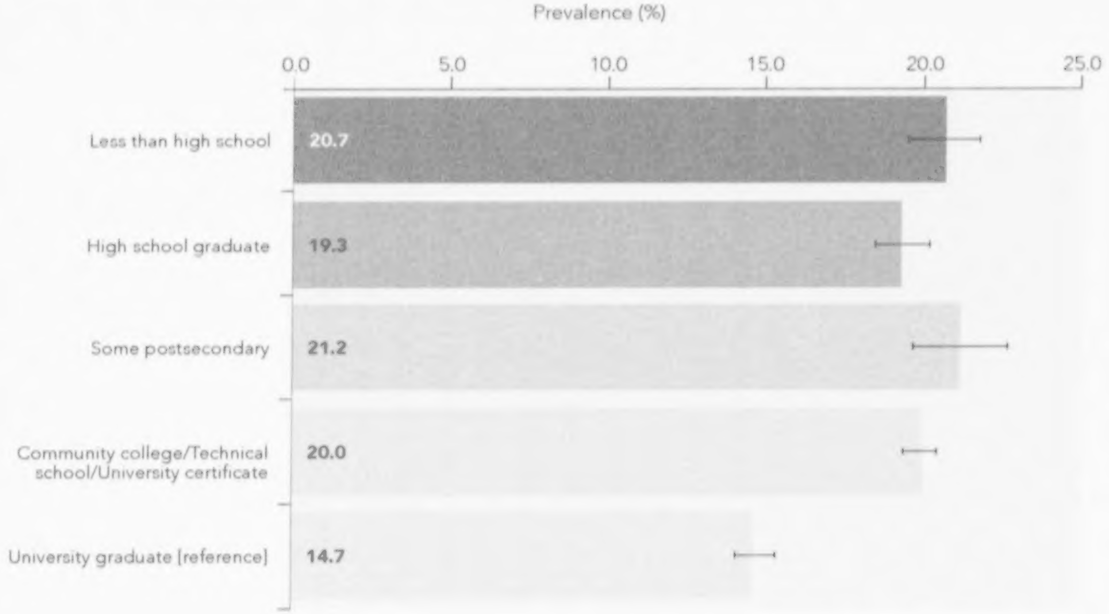


BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Q1 (lowest income)	0.6*	−10.0*	NA	NA	NA	NA
Q2	0.7*	−8.2*	NA	NA	NA	NA
Q3	0.8*	−5.3*	NA	NA	NA	NA
Q4	0.9*	−3.3*	NA	NA	NA	NA
Q5 (highest income) reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Q1 (lowest income)	0.7*	−4.6*	NA	NA	NA	NA
Q2	0.7*	−4.0*	NA	NA	NA	NA
Q3	0.8*	−3.2*	NA	NA	NA	NA
Q4	0.9*	−2.1*	NA	NA	NA	NA
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Q1 (lowest income)	0.6*	−12.0*	NA	NA	NA	NA
Q2	0.7*	−9.7*	NA	NA	NA	NA
Q3	0.8*	−5.5*	NA	NA	NA	NA
Q4	0.9*	−3.4*	NA	NA	NA	NA
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
High alcohol consumption refers to having 5 or more drinks on one occasion, between once a month to more than once a week over the past year.
Source: Canadian Community Health Survey (CCHS)- Annual Component 2010–2012

FIGURE 6

High Alcohol Consumption by Education Level, Canada, ages 20+ years, 2010–2012



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Less than high school	1.4*	6.0*	28.8*	4.3*	0.8*	206 320*
High school graduate	1.3*	4.6*	23.9*	4.1*	0.8*	198 620*
Some postsecondary	1.4*	6.5*	30.5*	2.1*	0.4*	103 360*
Community college/ Technical school/ University certificate	1.4*	5.2*	26.3*	10.5*	2.0*	511 080*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
High alcohol consumption refers to having 5 or more drinks on one occasion, between once a month to more than once a week over the past year.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2012

Employment Status and Occupation

The lowest prevalence of heavy drinking of all employment status groups was found among adults permanently unable to work, at 10.0% (95% CI: 8.0–12.1%). The next lowest was among those who did not have a job and were no longer looking for work, at 13.7% (95% CI: 12.9–14.5). The prevalence of heavy drinking among those who were employed or unemployed but still looking for work was higher, at 21.8% (95% CI: 21.3–22.2%) and 21.8% (95% CI: 20.0–23.6%), respectively. Compared with employed adults, there were 11.8 (95% CI: −13.8 to −9.7) fewer cases per 100 of heavy drinking among people permanently unable to work and 8.1 (95% CI: −9.0 to −7.1) fewer cases per 100 of heavy drinking among people no longer looking for work (Figure 7).

The prevalence of high alcohol consumption was highest among managers, at 23.0% (95% CI: 21.6–24.4%), and skilled/technical/supervisors, at 24.6% (95% CI: 23.8–25.3%). This was, respectively, 1.3 (95% CI: 1.2–1.5) and 1.4 (95% CI: 1.3–1.6) times the prevalence of professionals, who reported a heavy drinking prevalence of 17.2% (95% CI: 15.8, 18.5).

If managers and skilled/technical/supervisors experienced the same prevalence of heavy drinking as professionals, there would be a 25.2% (95% CI: 17.8–32.7%) and 30.0% (95% CI: 24.3–35.8%) reduction in heavy drinking, respectively. This would result in 106 770 (95% CI: 71 750–141 790) and 445 790 (95% CI: 355 020–536 550) fewer heavy drinkers in Canada.

> If people in managerial and in skilled, technical, or supervisory occupations reported the same prevalence of heavy drinking as professionals, there would be a 25.2% and 30.0% reduction in heavy drinking in these groups, respectively.

Rural/Urban Residence

Compared to large urban centres, the prevalence of high alcohol consumption was higher among adults living in remote[41] areas, at 22.2% (95% CI: 21.1–23.3%), and lower among adults living in the metropolitan areas of Toronto, Montréal, and Vancouver, at 15.1% (95% CI: 14.5–15.8%) (Annex 1).

If the prevalence among those living in remote areas was the same as that among those living in large urban centres (other than Toronto, Montréal, and Vancouver), there would be 23 360 (95% CI: 2 270–44 450) fewer heavy drinkers in Canada.

DATA GAPS/LIMITATIONS

The inequalities in high alcohol consumption within the various socioeconomic and sociodemographic population groups constitute a comprehensive baseline measure of inequalities in Canada. Data gaps and limitations should be considered to better understand the estimated magnitude of inequalities and for any potential comparison or future monitoring of the reported results.

As data from the CCHS and RHS are self-reported, the extent to which heavy drinking occurs may be underestimated. When data from the 2008–2010 Canadian Alcohol and Drug Use Monitoring Survey were adjusted for under-reporting, the proportion of Canadians who engaged in risky drinking increased from 16.7% to 38.6% for short-term harm and from 6.8% to 27.3% for long-term harm (9). In addition, the data used in this chapter capture only one aspect of alcohol use—having 5 or more drinks on one occasion at least once a month over the past year. How many times per month or how many drinks per occasion beyond 5 drinks Canadians consume were not studied. Alcohol consumption below the 5-drink threshold can also exceed safe drinking guidelines and lead to adverse health outcomes. Furthermore,

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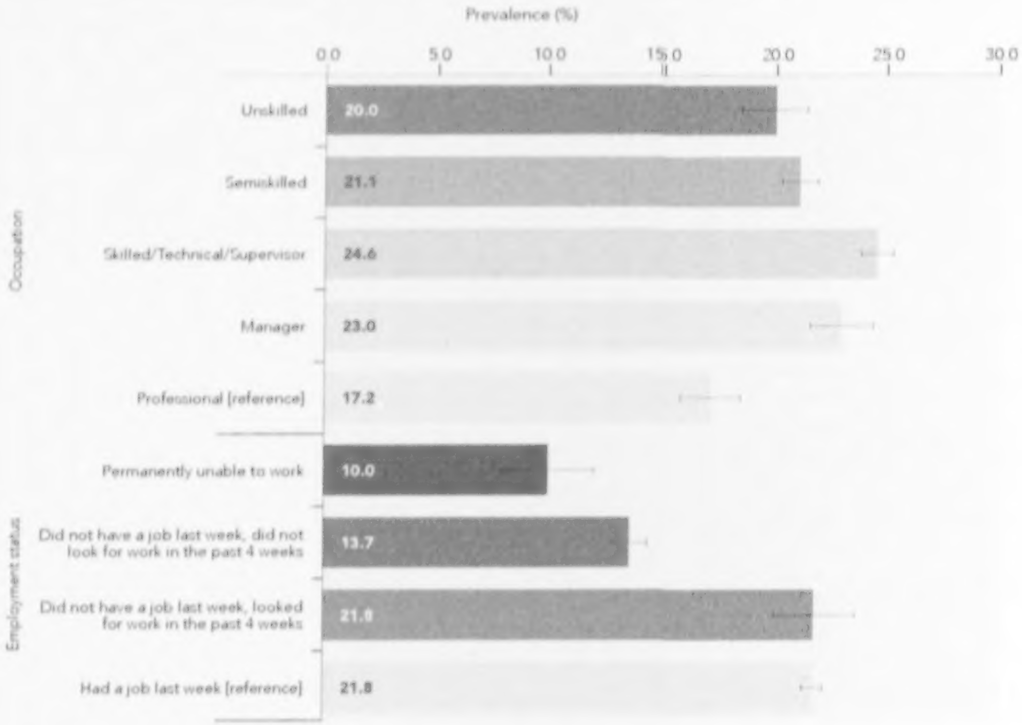
[41] For definitions of rural/urban subgroups, see the Methodology chapter.

FIGURE 7

High Alcohol Consumption by Employment Status and Occupation, Canada, ages 18–75 years, 2010–2012



OCCUPATION	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Unskilled	1.2*	2.8*	13.9*	1.0*	0.2*	49 260*
Semiskilled	1.2*	3.9*	18.5*	3.8*	0.8*	183 150*
Skilled/Technical/Supervisor	1.4*	7.4*	30.0*	9.1*	1.8*	445 790*
Manager	1.3*	5.8*	25.2*	2.2*	0.4*	106 770*
Professional [reference]	1.0	0.0	0.0	0.0	0.0	0
EMPLOYMENT STATUS						
Permanently unable to work	0.5*	−11.8*	NA	NA	NA	NA
Did not have a job last week, did not look for work in the past 4 weeks	0.6*	−8.1*	NA	NA	NA	NA
Did not have a job last week, looked for work in the past 4 weeks	1.0	0.0	NA	NA	0.0	NA
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
*: Significantly different from the reference category
Age standardization was performed using the 2011 Census of Population.
High alcohol consumption refers to having 5 or more drinks on one occasion, between once a month to more than once a week over the past year.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2010–2012

data on the harmful effects of alcohol consumption were not collected. Thus, the inequalities of the adverse effects of heavy drinking are not captured here.

The data presented are cross-sectional in nature and do not capture the change in individual alcohol consumption, for example. Nor do the data capture other potentially modifiable characteristics such as employment, education, or income. However, they capture the depth and impact of inequalities in high alcohol consumption on different socially stratified groups at a given point in time. The disproportionate burden of high alcohol consumption among these groups is driven by a complex system of social and structural drivers of health that remains to be fully explored and understood.

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (8), calculating *p*-values would confirm statistically significant differences.

Moreover, the measures quantify the inequalities experienced by social groups that are defined by broad categories presumed to be distinct. The inequalities facing individuals and communities who hold multiple and intersecting identities are not captured here. The inequitable distribution of the prevalence of high alcohol consumption within broadly defined social groupings is also not explored. Missing data may result in some inequalities not being reported. In other cases, small numbers mean that data need to be interpreted with caution.

DISCUSSION

High alcohol consumption is a public health concern in Canada, with one-fifth of Canadian adults drinking 5 or more drinks on one occasion at least once a month in the past year. Excessive alcohol consumption is linked to significant health and economic burdens. The greatest inequalities in heavy drinking were found by sex/gender, income, education, Indigenous identity, and occupation.

The prevalence of heavy drinking was over twice as high among men as among women, which is supported by evidence consistently reported worldwide (10). It is important to note that the definition of high alcohol consumption the CCHS uses was updated in 2013 to conform to World Health Organization and Health Canada guidelines. While the amount was reduced for women to 4 or more drinks on one occasion at least once a month in the past year, the amount stayed the same for men (11). Therefore, this chapter underestimates the prevalence of heavy drinking among women. Inequalities in men's and women's alcohol use reflect gender roles, such as greater risk-taking among men associated with heavier drinking, and cultural expectations, such as greater public acceptance of intoxication of men than of women (12).

The prevalence of high alcohol consumption among bisexual and lesbian women was, respectively, 1.7 and 1.6 times that of heterosexual women. The increased prevalence of heavy drinking among lesbian or bisexual women compared with heterosexual women but not among gay or bisexual men relative to heterosexual men has also been observed in the United States of America (13) and other countries (12). These inequalities in heavy drinking by sexual orientation may be due, in part, to the stressors of being a sexual minority, including victimization, prejudice, and internalized homophobia, and resulting negative coping mechanisms (12). The "gender paradox" of an increased risk for lesbian or bisexual women but not for gay or bisexual men has been attributed to a rejection of traditional gender roles and expectations regarding alcohol use by sexual minorities (12).

Compared with non-Indigenous adults, the prevalence of heavy drinking was higher among First Nations adults living on reserve and in northern communities and off reserve and among Métis and Inuit adults. This pattern of inequalities in high alcohol consumption has been seen elsewhere; for example, Indigenous Australians have been found to be 1.5

times as likely to drink alcohol at risky levels as non-Indigenous Australians (14). Many Indigenous communities, in Canada and in other countries, face high unemployment, poor housing, and inadequate health care services as well as isolation, poverty, stigmatization, and language barriers. These challenges, as well as the transgenerational effects of colonization, loss of cultural identity, and residential schools, can lead to an increased likelihood of substance abuse (15) (Box 1).

At the same time, it is important to recognize that alcohol consumption patterns also vary within Indigenous populations. In fact, the RHS 2008/10 national report noted that First Nations people living on reserve and in northern communities abstain from alcohol more often than the non-Indigenous population (16). Although the prevalence for alcohol consumption is not age standardized in that report, more than one-third (35.3%) of the First Nations people surveyed abstained from alcohol compared with less than one-quarter (23.0%) of the general Canadian population (17). Similarly, another study indicates that the rates of reported alcohol abstention among First Nations living off reserve and Inuit (12 years and older) were higher than among non-Indigenous people, at 30.9% and 37.6%, respectively; they also did not drink in the past year compared with 23.5% of the non-Indigenous population. For Métis, the comparable percentage was 24.9% (18). Likewise, in 2010, Indigenous Australians were 1.4 times as likely as non-Indigenous Australians to abstain from drinking alcohol (14).

Heavy drinking does not follow the same socio-economic inequality gradient typically seen with other indicators. Canadians living in low income reported the lowest prevalence of heavy drinking while those living in high income reported the highest prevalence. Similarly, in the United Kingdom, alcohol consumption did not increase with increasing economic deprivation, and those with the lowest incomes had the lowest average alcohol consumption (28).

BOX 1

FOCUS ON FIRST NATIONS PEOPLE LIVING ON RESERVE AND IN NORTHERN COMMUNITIES– CONTEXTUALIZING RESULTS FROM THE FIRST NATIONS REGIONAL HEALTH SURVEY

Prepared by the First Nations Information Governance Centre

The historical trauma stemming from discriminatory government policies, including the forced separation from family and culture (e.g., Indian Residential Schools), has transmitted across generations, leaving many present-day First Nations people to experience systemic discrimination, victimization (e.g., racism, violence), and feelings of disconnection, a lack of belonging, and distrust (e.g., for government institutions) (19-21)). These traumatic experiences can result in heightened levels of stress, mental illness, and a susceptibility to maladaptive forms of coping, including alcohol misuse (22,23). Due to the isolated settings and small populations of many First Nations communities, there are often barriers for socioeconomic development, including opportunities for employment and accessible health care services. In particular, mental health services that could assist First Nations people in developing adaptive modes of coping with stress and trauma are often not available, culturally inappropriate, or not readily accessible (because of geographic distances or financial barriers) (19,24). The normalization of alcohol use and the disconnection from traditional parenting practices along with low health literacy and poor prenatal care also contribute to higher rates of alcohol misuse (25,26). The disproportionately high rates of fetal alcohol syndrome (FAS) among First Nations people is the result of elevated rates of alcohol use during pregnancy, which impairs fetal development (27). FAS causes a range of lifelong effects (e.g. cognitive delay, language disorders, physical abnormalities) that can in turn increase the likelihood of alcohol misuse across the lifespan (27).

However, the literature suggests that although alcohol use and income may not follow the same pattern as other health indicators, the harmful effects of alcohol use are concentrated among those living in low income (29). One systematic review and meta-analysis found that lower socioeconomic status groups had a rate of alcohol-related mortality 1.5 to 2.0 times greater than other causes of mortality (30). In Australia, people in lower socioeconomic status groups had greater levels of alcohol-related harms than people in higher socioeconomic status groups at the same level of alcohol consumption (4). Furthermore, concurrent experience of other types of socioeconomic disadvantages is associated with greater inequalities in alcohol-related harm.

There was no clear gradient between high alcohol consumption and education. Previous studies of education and problematic alcohol use have been inconsistent, with some studies reporting a positive association (31,32) and others an inverse association (33,34). However, consistent differences in binge drinking patterns according to education were observed. In the United States, for example, while high school dropouts reported a lower prevalence of binge drinking than their counterparts who had completed high school, binge drinkers who had not graduated from high school consumed more drinks per episode of binge drinking than those with at least a high school education (35). Less-educated groups were also more likely to report negative consequences of alcohol use than more educated groups, even after controlling for drinking patterns (36).

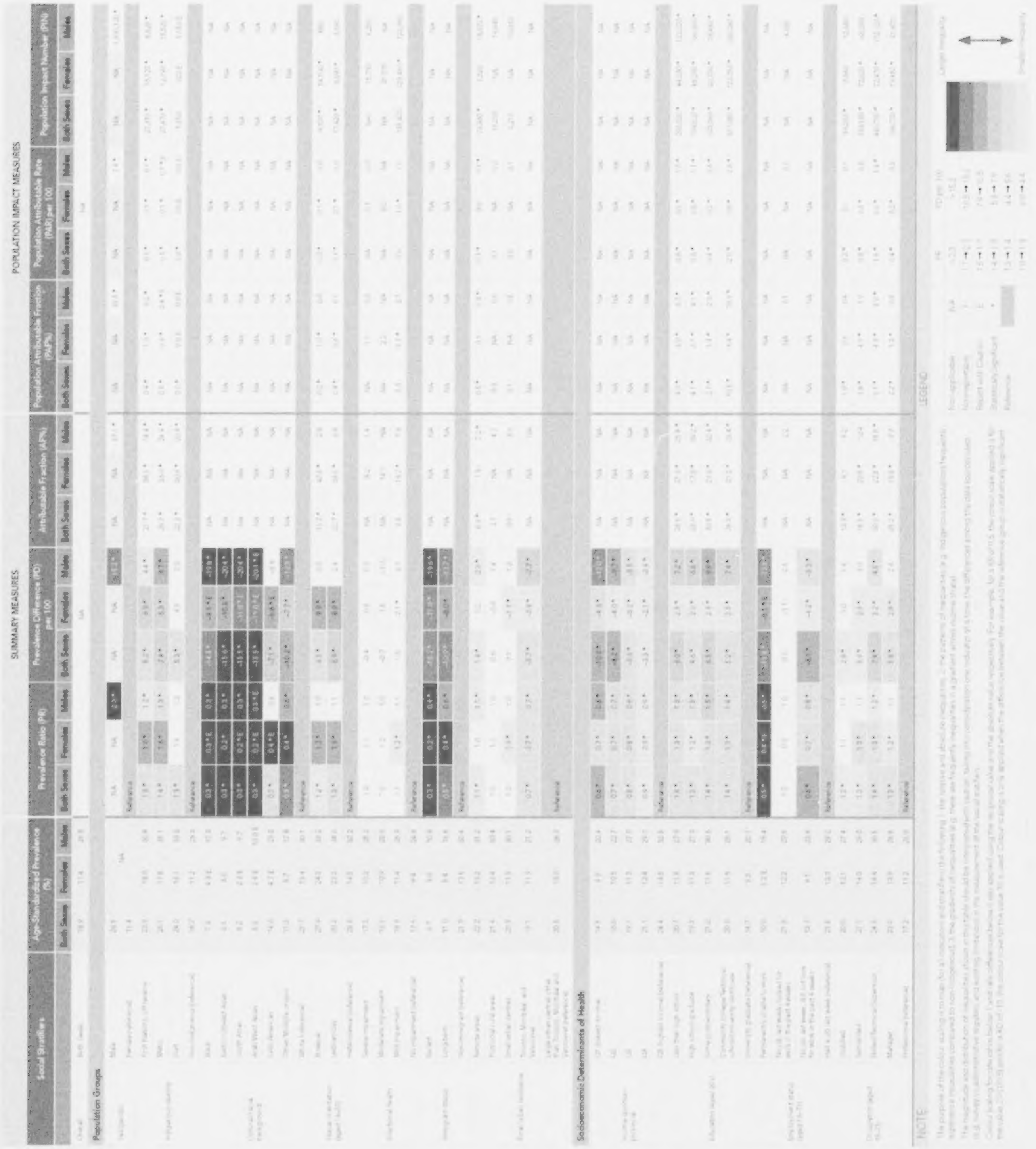
People in managerial or supervisory positions reported the highest prevalence of heavy drinking by occupational category. Inequalities in high alcohol consumption by occupation could be due to the characteristics of the work. For example, high levels of social support in the workplace, job motivation, and job satisfaction have been found to be related to low alcohol consumption, while job stress, overwork, long hours, harassment, and job insecurity have been linked to high alcohol consumption (1).

White Canadians had significantly higher rates of heavy drinking than people from other cultural groups. In the United States, although the prevalence of heavy drinking was lower among Black and Hispanic Americans than among White Americans, their risk for negative consequences and dependence was greater (37).

Non-immigrants also engaged in heavy drinking at much higher rates than recent or long-term immigrants. Although the health behaviour patterns of immigrants tends to eventually mirror patterns of host country residents, factors such as length of residence, age at immigration, and country of origin all moderate this relationship (38). While other research has noted lower reported rates of alcohol use among immigrants than among Canadian-born adults, alcohol consumption based on duration of residence in Canada varied depending on country of origin (38).

While many Canadians drink responsibly, heavy alcohol consumption is identified as one of the leading risk factors for death and disability (2). Inequalities in the prevalence of heavy alcohol consumption are evident across a number of social stratifiers, including gender, occupation, sexual orientation, and Indigenous identity. Although less common among immigrants, identified cultural/racial groups, and people who are permanently unable to work, the prevalence of heavy alcohol consumption increases with increasing income along a clear gradient. While the most educated appear to consume alcohol more moderately than other education groups, a similar gradient is not apparent. Although individual factors influence patterns of alcohol consumption, these are greatly affected by the social and physical environments. Measuring inequalities helps to inform and strengthen interventions to reduce the revealed differences and related impacts of heavy alcohol consumption. However, fully addressing these inequalities also requires policy interventions that affect pricing and taxation, minimum age laws, and alcohol advertising (1). The ongoing monitoring of health inequalities across sociodemographic and socioeconomic groups will in turn inform how these are changing over time and further inform programs, policies and research.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for High Alcohol Consumption. Data Source: CCHS 2010-2012


SUMMARY MEASURES
POPULATION IMPACT MEASURES
Social Stratifiers
Age-Standardized Prevalence (%)
Prevalence Ratio (PR)
Prevalence Difference (PD) per 100
Attributable Fraction (AF%)
Population Attributable Fraction (PAF%)
Population Attributable Rate (PAR) per 100
Population Impact Number (PIN)
Both Sexes
Females
Males
Population Groups
Socioeconomic Determinants of Health
Reference
NOTE
LEGEND

References

(1) Public Health Agency of Canada. The Chief Public Health Officer's report on the state of public health in Canada 2015: Alcohol consumption in Canada [Internet]. Ottawa: Public Health Agency of Canada; 2016 [cited 2017 Feb 15]. Available from: https://www.canada.ca/en/public-health/services/publications/chief-public-health-officer-reports-state-public-health-canada/2015-alcohol-consumption-canada.html.

(2) Institute for Health Metrics and Evaluation. GBD profile: Canada [Internet]. Seattle: Institute for Health Metrics and Evaluation; 2015 [cited 2017 Feb 15]. Available from: https://www.healthdata.org/sites/default/files/files/country_profiles/GBD/ihme_gbd_country_report_canada.pdf.

(3) Rehm J, Baliunas D, Brochu S, Fischer B, Gnam W, Patra J, et al. The costs of substance abuse in Canada 2002. Ottawa: Canadian Centre on Substance Abuse. 2006:1-14.

(4) Roche A, Kostadinov V, Fischer J, Nicholas R, O'Rourke K, Pidd K, et al. Addressing inequities in alcohol consumption and related harms. Health Promot Internation. 2015;30(suppl_2):ii20-35.

(5) Stockwell T, Zhao J, Martin G, Macdonald S, Vallance K, Treno A, et al. Minimum alcohol prices and outlet densities in British Columbia, Canada: estimated impacts on alcohol-attributable hospital admissions. Am J Public Health. 2013;103(11):2014-20.

(6) Stockwell T, Zhao J, Macdonald S, Vallance K, Gruenewald P, Ponicki W, et al. Impact on alcohol related mortality of a rapid rise in the density of private liquor outlets in British Columbia: a local area multi level analysis. Addiction. 2011;106(4):768-76.

(7) Canadian Institute for Health Information. Trends in income-related health inequalities in Canada: technical report: revised July 2016 [Internet]. Ottawa: Canadian Institute for Health Information; 2016 [cited 2017 Feb 15]. Available from: https://secure.cihi.ca/free_products/trends_in_income_related_inequalities_in_canada_2015_en.pdf.

(8) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(9) Zhao J, Stockwell T, Thomas G. An adaptation of the Yesterday Method to correct for under-reporting of alcohol consumption and estimate compliance with Canadian low-risk drinking guidelines. Can J Public Health. 2015;106(4):204-9.

(10) Wilsnack RW, Wilsnack SC, Kristjanson AF, Vogeltanz Holm ND, Gmel G. Gender and alcohol consumption: patterns from the multinational GENACIS project. Addiction. 2009;104(9):1487-500.

(11) Statistics Canada. [Internet]. Ottawa: Statistics Canada; 2015. Heavy drinking, 2013 [updated 2015 Nov 27; cited 2017 Feb 15]; [about 3 screens]. Available from: http://www.statcan.gc.ca/pub/82-625-x/2014001/article/14019-eng.htm#n1.

(12) Hughes TL, Wilsnack SC, Kantor LW. The influence of gender and sexual orientation on alcohol use and alcohol-related problems: Toward a global perspective. Alcohol Res. 2016;38(1):121-32.

(13) Operario D, Gamarel KE, Grin BM, Lee JH, Kahler CW, Marshall BD, et al. Sexual minority health disparities in adult men and women in the United States: National Health and Nutrition Examination Survey, 2001–2010. Am J Public Health. 2015 10/01; 2017/08;105(10):e27-34.

(14) Australian Institute of Health and Welfare. 2010 National drug strategy household survey report [Internet]. Canberra: Australian Institute of Health and Welfare; 2011 [cited 2017 Feb 15]. Available from: http://www.aihw.gov.au/publication-detail/?id=32212254712.

(15) Canadian Centre on Substance Abuse. [Internet]. Ottawa: Canadian Centre on Substance Abuse; 2016. First Nations, Inuit and Métis [updated 2017 cited 2017 Feb 15]; Available from: http://www.ccsa.ca/Eng/topics/First-Nations-Inuit-and-Metis/Pages/default.aspx.

(16) First Nations Information Governance Centre. First Nations regional health survey (RHS) 2008/10: national report on adults, youth and children living in First Nations communities [Internet]. Ottawa: First Nations Information Governance Centre; 2012 [cited 2017 Apr 10]. Available from: https://fnigc.ca/sites/default/files/docs/first_nations_regional_health_survey_rhs_2008-10_-_national_report.pdf.

(17) Health Canada. [Internet]. Ottawa: Health Canada; 2012. Health Concerns: Canadian Alcohol and Drug Use Monitoring Survey, 2010 [updated 2017 Jul 03; cited 2017 Feb 15]; [about 7 screens]. Available from: http://www.hc-sc.gc.ca/hc-ps/drugs-drogues/stat/_2010/summary-sommaire-eng.php#alc.

(18) Kelly-Scott K and Smith K. Aboriginal peoples: Fact sheet for Canada [Internet]. Ottawa: Statistics Canada; 2015 [cited 2017 Oct 25]. Available from: http://www.statcan.gc.ca/pub/89-656-x/89-656-x2015001-eng.pdf.

(19) Nelson S. Challenging hidden assumptions: Colonial norms as determinants of Aboriginal mental health [Internet]. Prince George: National Collaborating Centre for Aboriginal Health; 2012 [cited 2017 Sep 29]. Available from: https://www.ccnsa-nccah.ca/docs/determinants/FS-ColonialNorms-Nelson-EN.pdf.

(20) Loppie S, Reading C and de Leeuw S. Aboriginal experiences with racism and its impacts [Internet]. Prince George: National Collaborating Centre for Aboriginal Health; 2014 [cited 2017 Sep 29]. Available from: https://www.ccnsa-nccah.ca/docs/determinants/FS-AboriginalExperiencesRacismImpacts-Loppie-Reading-deLeeuw-EN.pdf.

(21) Statistics Canada. [Internet]. Ottawa: Statistics Canada; 2016. Victimization of Aboriginal peoples in Canada. Catalogue no. 85-002-X [updated 2016 Jun 28; cited 2017 Mar 23]; [about 24 screens]. Available from: http://www.statcan.gc.ca/pub/85-002-x/2016001/article/14631-eng.htm.

(22) Chansonneuve D. Addictive behaviours among Aboriginal peoples in Canada [Internet]. Ottawa: Aboriginal Healing Foundation; 2007 [cited 2017 Sep 29]. Available from: http://www.ahf.ca/downloads/addictive-behaviours.pdf.

(23) Kirmayer LJ, Brass GM, Tait CL. The mental health of Aboriginal peoples: Transformations of identity and community. The Canadian Journal of Psychiatry. 2000;45(7):607-16.

(24) Leyland A, Smylie J, Cole M, et al. Health and Health Care Implications of Systemic Racism on Indigenous Peoples in Canada [Internet]. Mississauga: The College of Family Physicians of Canada; 2016 [cited 2017 Sep 29]. Available from: http://www.cfpc.ca/uploadedFiles/Resources/_PDFs/SystemicRacism_ENG.pdf.

(25) Chiefs of Ontario. Ontario regions First Nations addictions service assessment [Internet]. Toronto: Chiefs of Ontario; 2009 [cited 2017 Sep 29]. Available from: http://www.chiefs-of-ontario.org/sites/default/files/files/Final%20draft%20Addiction%20Service%20Needs%20Assessment%20report.pdf.

(26) Popova S, Lange S, Probst C, Parunashvili N, Rehm J. Prevalence of alcohol consumption during pregnancy and Fetal Alcohol Spectrum Disorders among the general and Aboriginal populations in Canada and the United States. European journal of medical genetics. 2017;60(1):32-48.

(27) Popova S, Lange S, Shield K, Mihic A, Chudley AE, Mukherjee RA, et al. Comorbidity of fetal alcohol spectrum disorder: a systematic review and meta-analysis. The Lancet. 2016;387(10022):978-87.

(28) Smith K and Foster J. Alcohol, health Inequalities and the Harm Paradox: Why some groups face greater problems despite consuming less alcohol [Internet]. London: Institute for Alcohol Studies; 2014 [cited 2017 Feb 15]. Available from: http://www.ias.org.uk/uploads/pdf/IAS%20reports/IAS%20report%20Alcohol%20and%20health%20inequalities%20FULL.pdf.

(29) Makela P, Paljarvi T. Do consequences of a given pattern of drinking vary by socioeconomic status? A mortality and hospitalisation follow-up for alcohol-related causes of the Finnish Drinking Habits Surveys. J Epidemiol Community Health. 2008 Aug;62(8):728-33.

(30) Probst C, Roerecke M, Behrendt S, Rehm J. Socioeconomic differences in alcohol-attributable mortality compared with all-cause mortality: a systematic review and meta-analysis. Int J Epidemiol. 2014;43(4):1314-27.

(31) Slutske WS. Alcohol use disorders among US college students and their non–college-attending peers. Arch Gen Psychiatry. 2005;62(3):321-7.

(32) Huerta MC, Borgonovi F. Education, alcohol use and abuse among young adults in Britain. Soc Sci Med. 2010;71(1):143-51.

(33) Casswell S, Pledger M, Hooper R. Socioeconomic status and drinking patterns in young adults. Addiction. 2003;98(5):601-10.

(34) Jefferis BJ, Manor O, Power C. Social gradients in binge drinking and abstaining: trends in a cohort of British adults. J Epidemiol Community Health. 2007 Feb;61(2):150-3.

(35) Kanny D, Liu Y, Brewer RD, Lu H. Binge drinking—United States, 2011. MMWR Surveill Summ. 2013;62(Suppl 3):77-80.

(36) Grittner U, Kuntsche S, Graham K, Bloomfield K. Social inequalities and gender differences in the experience of alcohol-related problems. Alcohol and alcoholism. 2012;47(5):597-605.

(37) Karriker-Jaffe KJ, CM Roberts S, Bond J. Income inequality, alcohol use, and alcohol-related problems. Am J Public Health. 2013;103(4):649-56.

(38) Agic B, Mann RE, Tuck A, Ialomiteanu A, Bondy S, Simich L, et al. Alcohol use among immigrants in Ontario, Canada. Drug Alcohol Rev. 2016;35(2):196-205.

INEQUALITIES IN
SMOKING, EXPOSURE TO SECOND-HAND SMOKE, AND LUNG CANCER INCIDENCE IN CANADA

INEQUALITIES HIGHLIGHTS

- The prevalence of smoking among adult Canadians who did not complete high school is 3.9 times that of university graduates. Among adults with less than a high school education, exposure to second-hand smoke in the home is 4.0 times that of university graduates. This represents 28.8 more smokers and 6.6 more cases of exposure to second-hand smoke in the home among adult Canadians who did not complete high school than among university graduates, per 100 adults.
- The prevalence of smoking among adults in the lowest income group is 1.9 times the prevalence among adults in the highest income group. Similarly, the prevalence of exposure to second-hand smoke in the home among adults in the lowest income group is 1.7 times the prevalence among adults in the highest income group. This means there are 13.3 more smokers and 2.3 more cases of exposure to second-hand smoke in the home, per 100 adults, among adults in the lowest income group than among adults in the highest income group.
- Adults living in the lowest income areas have a lung cancer incidence rate that is 1.7 times that of adults living in the highest income areas whereas adults with the lowest levels of education have a lung cancer incidence rate that is 1.5 times that of adults with the highest education levels. This corresponds to 36.7 and 29.3 more cases of lung cancer, per 100 000 adults, among adults living in the lowest income areas and among adults with the lowest levels of education.
- The prevalence of smoking and exposure to second-hand smoke in the homes of unskilled workers is, respectively, 2.6 and 2.5 times that of people in professional occupations. This corresponds to 17.4 more smokers and 3.8 more cases of exposure to second-hand smoke in the home, per 100 adults, among unskilled workers than among people in professional occupations. The prevalence of smoking and exposure to second-hand smoke in the home among adults who are permanently unable to work is 1.8 and 2.2 times that of employed adults. This represents 17.1 more smokers and 5.2 more cases of exposure to second-hand smoke in the home among adults who are permanently unable to work than among employed adults, per 100 adults.

- Smoking prevalence among Inuit, First Nations living off reserve, and Métis adults is, respectively, 2.4, 1.9, and 1.7 times that of non-Indigenous adults. This corresponds to 28.3, 18.4, and 13.8 more smokers among Inuit, First Nations living off reserve, and Métis adults than among non-Indigenous adults per 100 adults. Exposure to second-hand smoke in the home among First Nations living off reserve and Métis adults is, respectively, 2.0 and 1.4 times the rate among non-Indigenous people. This represents 4.2 and 1.7 more cases of exposure to second-hand smoke in the home among First Nations living off reserve and Métis adults than among non-Indigenous people per 100 adults. Rates of lung cancer incidence are also higher in areas where there is a high concentration of people who identify as Inuit, First Nations, or Métis. The rates are 2.6 times higher in areas where Inuit predominate; 1.7 times higher in areas where First Nations predominate; and 1.4 times higher in areas where Métis predominate than in areas with a low concentration of Indigenous people. This corresponds to 109.4, 46.2, and 27.9 more cases of lung cancer, per 100 000 adults, in areas where there is a high concentration of Inuit, First Nations, or Métis people, respectively, than in areas where there is a low concentration of Indigenous people.
- Smoking prevalence among non-immigrant adults is 1.5 times that of long-term immigrant adults and 2.1 times that of recent adult immigrants. This corresponds to 8.3 and 12.2 fewer smokers, per 100 people, among long-term and recent immigrants, respectively, than among non-immigrants. Exposure to second-hand smoke in the home among non-immigrant adults is, respectively, 1.5 and 1.6 times that of long-term and recent adult immigrants'. This corresponds to 1.6 and 1.7 fewer cases of exposure, per 100 adults, to second-hand smoke in the home among long-term and recent adult immigrants than among non-immigrants. The lung cancer incidence rate among adults living in areas with a low concentration of foreign-born residents is 1.6 times that of adults living in areas with a high concentration of foreign-born residents. This represents 28.4 more cases of lung cancer, per 100 000 adults, among adults living in areas with a low concentration of foreign-born residents than among adults living in areas with a high concentration of foreign-born residents.

ACRONYM	FULL NAME
CI	Confidence Interval
CCHS	Canadian Community Health Survey
CCR	Canadian Cancer Registry
PR	Prevalence Ratio
RHS	First Nations Regional Health Survey
RR	Rate Ratio
SHS	Second-Hand Smoke

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Smoking is the leading cause of preventable death in Canada, accounting for 17% of all deaths (1). The main causes of smoking-related deaths are many types of cancers, including lung cancer, as well as cardiovascular diseases, diabetes, and respiratory diseases (2). People who smoke cigarettes are 15 to 30 times more likely to be diagnosed with or die from lung cancer than people who do not smoke. In Canada, cigarette smoking is linked to about 85% of lung cancers (3). Estimates from 2002 indicate that about 37 000 Canadians die each year as a result of smoking-related diseases, resulting in 515 607 potential years of life lost (1). The economic burden of smoking in Canada is significant, at an estimated $18.7 billion in 2013 (4).

Exposure to smoke from other people's cigarettes, pipes, or cigars is also an established cause of lung cancer. In 2002, exposure to second-hand smoke (SHS) was responsible for 831 deaths among Canadian adults, with heart disease and lung cancer the main proximal causes of death (1). Infants exposed to SHS are at increased risk of sudden infant death syndrome, and children exposed to SHS are at increased risk of asthma attacks, respiratory infections, and ear infections (5).

The issues to do with smoking reflect a host of social determinants of health, including income, education levels, occupational class, job opportunities, intergenerational trauma, discrimination, and marginalization (6,7). Over the last century, smoking in Canada has followed a pattern seen in other developed countries: a steep rise in smoking prevalence among men followed by a smaller rise among women. This was then followed by declines in prevalence in both men and women, with sharper decreases among men (8,9). As in other industrialized countries, socioeconomic differences in the prevalence of smoking have become far more prominent as the "tobacco epidemic" continues in Canada (10). These differences reflect both higher uptake and lower quit rates among people with low socioeconomic status (11). Compared with men and women in higher socioeconomic groups, smoking prevalence among men and women in lower socioeconomic groups peaked later and rates of decline in smoking since the 1950s have been lower (12).

Patterns of exposure to SHS in the home mirror the patterns observed with active smokers. In Canada, lower income and education have been associated with higher rates of exposure to SHS in the home and in private vehicles (13,14). Higher exposure to SHS in the home has also been associated with other sociodemographic factors such as province of residence (Quebec, Atlantic Canada, and the Territories), younger ages, non-immigrant status, the receipt of social assistance, and living in households with no children younger than 12 years old (14). For these reasons, smoking, exposure to SHS, and lung cancer incidence were selected as indicators of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter.)

METHODS

Data on smoking and exposure to SHS in the home were obtained from the Canadian Community Health Survey (CCHS) for the years 2010 to 2013. The smoking indicator in the CCHS measured the proportion of people aged 18 years and older who reported at the time of the interview that they were current (daily or occasional) smokers.

Inequalities in the prevalence of smoking and exposure to SHS in the home were assessed by examining differences in the prevalence of each indicator according to social stratifiers grouped under socioeconomic and sociodemographic stratifiers. Sociodemographic stratifiers include sex/gender, Indigenous identity, cultural/racial background, immigrant status, sexual orientation (ages 18–59 years[42]), and rural/urban residence. Socioeconomic stratifiers include income, education (ages 20+ years), occupation, and employment status (ages 18–75 years). All stratifiers were assessed at the individual level, with the exception of household education for exposure to SHS in the home.

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[42] The CCHS does not collect data on sexual orientation from individuals over the age of 59 years.

For the Indigenous identity stratifier, the CCHS sampling frame captures information on Indigenous people who identify as Inuit, Métis, or First Nations living off reserve, but excludes First Nations people living on reserve and Inuit in the Quebec region of Nunavik. For First Nations people living on reserve and in northern communities, information on smoking and exposure to SHS in the home are collected by the First Nations Information Governance Centre and its regional partners through the First Nations Regional Health Survey (RHS). This chapter uses RHS data from 2008 to 2010.

For the smoking indicator, survey questions in the RHS are identical to those in the CCHS and thus directly comparable. For the SHS indicator, however, differences exist between the RHS and CCHS. The CCHS analysis of SHS was limited to adults aged 18 years and over and focused only on exposure to SHS in the home. This was defined as current non-smokers who answered "Yes" to the question, "Including both household members and regular visitors, does anyone smoke inside your home, every day or almost every day?" The RHS posed the question slightly differently: all adults (regardless of smoking behaviour) were asked "Do you have a smoke-free home?" During the analysis, responses were limited to those who answered "Not at all" to the question, "At the present time, do you smoke cigarettes?" All prevalence data presented in this chapter were age-adjusted using the 2011 Canadian Census of Population.

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequalities measures were reported along with their 95% confidence intervals (CI). Statistical significance was assessed using 95% confidence intervals (15). Sex/gender-specific inequalities for stratifiers were reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of obesity inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable fraction, population attributable rate, and population impact number. However, due to methodological limitations in combining two datasets (i.e. CCHS and RHS), results for First Nations people living on reserve and in northern communities were not included in the calculation of inequality measures and are reported here in terms of prevalence only.

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in Canada. (For more detailed information, see the Methodology chapter.)

FINDINGS

The overall prevalence of smoking among Canadians aged 18 years and older was 21.3% (95% CI: 20.9–21.6%), while the overall prevalence of exposure to SHS in the home was 4.4% (95% CI: 4.2–4.6%). Multiple social groups experienced inequalities in the burden of both smoking and exposure to SHS in the home (Annexes 1–2). (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Sex/Gender

Smoking prevalence among men was 1.3 (95% CI: 1.3–1.4) times as high as among women, with almost one-quarter (24.2%; 95% CI: 23.7–24.7%) of men reporting being current or occasional smokers compared with 18.3% (95% CI: 17.9%–18.8%) of women. An exception to the overall pattern of higher smoking prevalence among men was noted for Inuit: at 50.9% (95% CI: 44.5–57.3%), prevalence was slightly higher among women (versus 48.9%, 95% CI: 41.6–56.1%, for men).

Prevalence of exposure to SHS in the home was similar between men and women, with prevalence among men at 4.5% (95% CI: 4.3–4.8%) compared with 4.2% (95% CI: 4.0–4.5%) among women (Annexes 1–2).

Indigenous Peoples

Prevalence of smoking and exposure to SHS in the home among Indigenous adults was approximately 1.4 to 2 times higher than among non-Indigenous Canadians (Figure 1). Compared with non-Indigenous adults, smoking prevalence among Inuit adults was 2.4 (95% CI: 2.1–2.6) times; 1.9 (95% CI: 1.8–2.0) times among First Nations adults living off reserve; and 1.7 (95% CI: 1.6–1.8) times among Métis adults (Figure 1).

If smoking prevalence among Inuit adults, First Nations adults living off reserve, and Métis adults was the same as among non-Indigenous adults, there would be a 57.8% (95% CI: 53.3–62.4%), 47.1% (95% CI: 43.8–50.4%), and 40.0% (95% CI: 36.0–44.1%) reduction in smoking prevalence, respectively. This potential reduction would result in 8 040 (95% CI: 6 280–9 810), 51 670 (95% CI: 42 650–60 680), and 77 110 (95% CI: 66 910–87 300) fewer smokers among Inuit, First Nations adults living off reserve, and Métis people in Canada (Figure 1).

Based on data from the RHS, the prevalence of smoking among First Nations adults living on reserve and in northern communities was 50.2% (95% CI: 48.7–51.8%).[43] No significant sex differences in smoking prevalence were observed between men and women in this population group (50.3% vs 50.2%, respectively).

Compared with non-Indigenous adults, the prevalence of exposure to SHS in the home was 2.0 (95% CI: 1.6–2.4) times higher among First Nations adults living off reserve and 1.4 (95% CI: 1.1–1.7) times higher among Métis adults. For statistical reasons, the results for the Inuit population group should be interpreted with caution, and are presented in relative and absolute inequalities (Annex 2).

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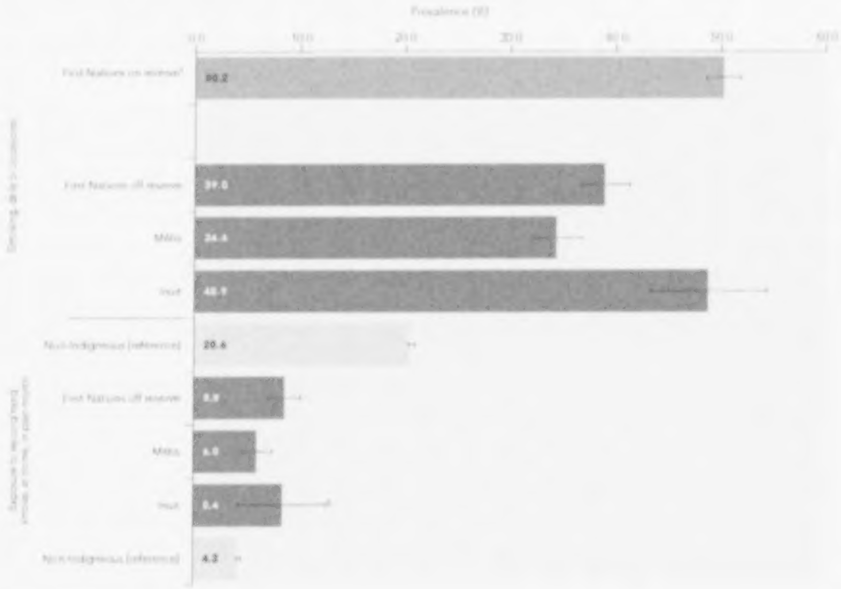
[43] RHS prevalence data are presented alongside CCHS data to approximate the magnitude of inequality between First Nations people living on reserve and in northern communities and the non-Indigenous population. Due to methodological limitations, inequality measures were not calculated for the RHS dataset.

FIGURE 1

Smoking and Exposure to Second-hand Smoke in the Home by Indigenous Identity, Canada, ages 18+ years, 2010–2013



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
SMOKING						
First Nations off reserve	1.9*	18.4*	47.1*	1.3*	0.3*	77 110*
Métis	1.7*	13.8*	40.0*	0.9*	0.2*	51 670*
Inuit	2.4*	28.3*	57.8*	0.1*	0.0*	8 040*
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0
EXPOSURE TO SECOND-HAND SMOKE						
First Nations off reserve	2.0*	4.2*	49.6*	1.1*	0.0*	10 260*
Métis	1.4*	1.7*	28.4*	0.4*	0.0*	4 010*
Inuit	2.0E	4.1E	48.8*E	0.1E	0.0E	510E
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0

E: Reportable with caution
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Sources: Canadian Community Health Survey (CCHS)–Annual Component 2010–2013
¹First Nations Regional Health Survey (RHS) 2008–2010

If prevalence of exposure to SHS in the home among First Nations adults living off reserve was as low as this prevalence among non-Indigenous adults, exposure to SHS in the home would be reduced by 49.6% (95% CI: 40.0–59.2%) in this population. This would result in 10 260 (95% CI: 6 430–14 090) fewer First Nations adults living off reserve being exposed to SHS in the home. Likewise, if prevalence of exposure to SHS in the home among Métis adults was as low as that among non-Indigenous adults, there would be a 28.4% (95% CI: 11.5–45.3%) reduction in exposure to SHS in the home among Métis adults. This would result in 4 010 (95% CI: 710–7 300) fewer Métis adults exposed to SHS in the home (Figure 1).

According to RHS data, almost one-fifth (17.9%; 95% CI: 16.1–19.6%) of non-smoking First Nations adults living on reserve and in northern communities were exposed to SHS in the home. While this prevalence is notably higher than that among non-Indigenous people (4.3%; 95% CI: 4.1–4.5%; based on CCHS data), comparing the results for these two population groups should be done with caution, as the wording of the applicable survey questions differ between the RHS and CCHS (see the Methods section). In terms of sex differences, exposure to SHS in the home was similar for men and women in the general population. However, among First Nations adults living on reserve, non-smoking men were 1.6 (22.0%; 95% CI: 19.5–24.5%) times more likely to be exposed to SHS in the home than non-smoking women (13.7%; 95% CI: 11.7–15.8%).

Cultural/Racial Background

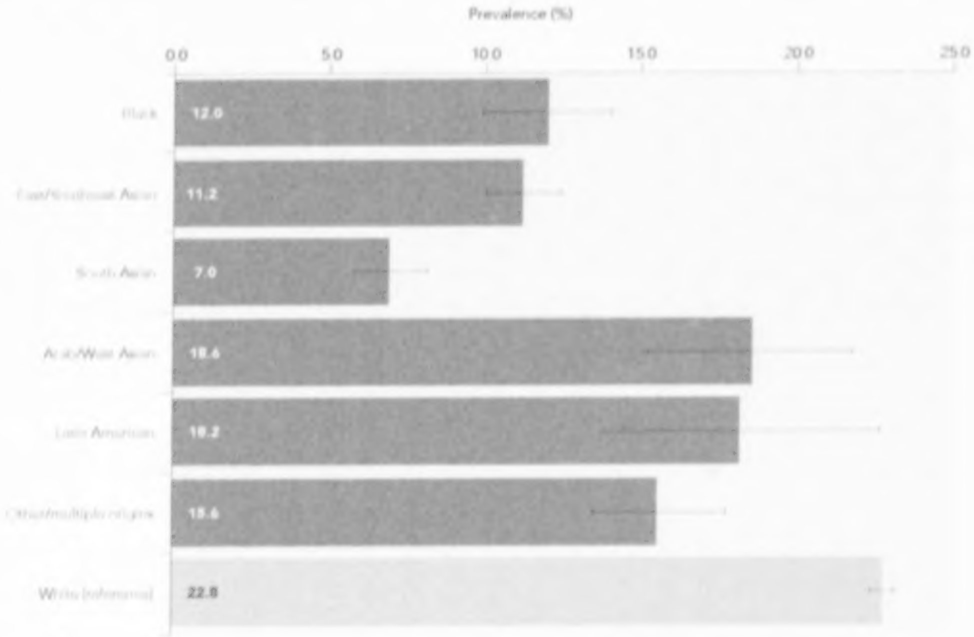
The prevalence of smoking and exposure to SHS in the home was higher among White adults than other cultural/racial groups. Among Black adults, smoking prevalence was 0.5 (95% CI: 0.4–0.6) times that of White adults; 0.5 (95% CI: 0.4–0.5) times among East/South East Asian adults; and 0.3 (95% CI: 0.3–0.4) times among South Asian adults (Figure 2).

Inequalities between White adults and Black and East/South Asian adults also differed by sex/gender. For example, among East/South East Asian women, the prevalence of smoking was one-fifth (prevalence ratio [PR] = 0.2; 95% CI: 0.2–0.3) that of White women and among East/South East Asian men, it was four-fifths (PR = 0.8; 95% CI: 0.7–0.9) that of White men (Annex 1).

The prevalence of SHS exposure in the home among East/South East Asian Canadians was 0.7 (95% CI: 0.5–0.8) times that of White adults. Due to statistical limitations, results for SHS exposure among other cultural/racial groups should be interpreted with caution (Annex 2).

FIGURE 2

Smoking by Cultural/Racial Background, Canada, ages 18+, 2010–2013



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR)	POPULATION IMPACT NUMBER (PIN)
Black	0.5*	−10.8*	NA	NA	NA	NA
East/Southeast Asian	0.5*	−11.6*	NA	NA	NA	NA
South Asian	0.3*	−15.8*	NA	NA	NA	NA
Arab/West Asian	0.8*	−4.2*	NA	NA	NA	NA
Latin American	0.8*	−4.6*	NA	NA	NA	NA
Other/Multiple origins	0.7*	−7.2*	NA	NA	NA	NA
White [reference]	1.0	0.0	0.0	0.0	0.0	0

* Significantly different from reference category
NA: Non-applicable
Age standardization was performed using the 2011 Census of Population
Source: Canadian Community Health Survey (CCHS)–Annual Component (2010–2013)

Sexual Orientation (ages 18–59 years)

While there were no significant differences in exposure to SHS in the home by sexual orientation, there were differences in smoking. The prevalence of smoking among adults who identified as bisexual was 1.6 (95% CI: 1.5–1.8) times that of adults who identified as heterosexual.

If the prevalence of smoking was the same among bisexual adults as among heterosexual adults, there would be a 39.1% (95% CI: 32.4–45.7%) reduction in smoking prevalence among bisexual adults.

The prevalence of smoking among adults who identified as lesbian or gay was also higher: among lesbian women, it was 1.4 (95% CI: 1.2–1.6) times that of heterosexual women and among gay men, it was 1.3 (95% CI: 1.1–1.5) times that of heterosexual men (Annex 1).

Functional Health

Both the prevalence of smoking and exposure to SHS in the home among adults with health impairments were higher than among adults with no health impairments. Among adults with severe impairments, smoking prevalence was 1.9 (95% CI: 1.7–2.0) times that of adults with no impairments (Annex 1).

If the prevalence of smoking among adults with severe impairments was the same as among adults with no health impairments, there would be a 46.2% (95% CI: 42.5–50.0%) reduction in the prevalence of smoking for adults with severe impairments. This would result in 550 340 (95% CI: 485 340–615 340) fewer adults smoking in Canada.

Being exposed to SHS at home increased as the level of impairment increased. The prevalence of SHS at home among adults with both severe and moderate health impairments was, respectively, 1.6 (95% CI: 1.3–2.0) times and 1.4 (95% CI: 1.2–1.7) times the prevalence of SHS exposure among adults with no health impairments.

If the prevalence among adults with severe impairments was the same as the prevalence among adults with no health impairments, there would be a 39.3% (95% CI: 26.6–52.1%) reduction in exposure to SHS in the home among adults with severe impairments. This corresponds to a 6.6% (95% CI: 3.6–9.6%) reduction in exposure to SHS in the home in Canada and potentially 62 180 (95% CI: 33 700–90 660) fewer adults exposed to SHS in Canada (Annex 2).

Immigrant Status

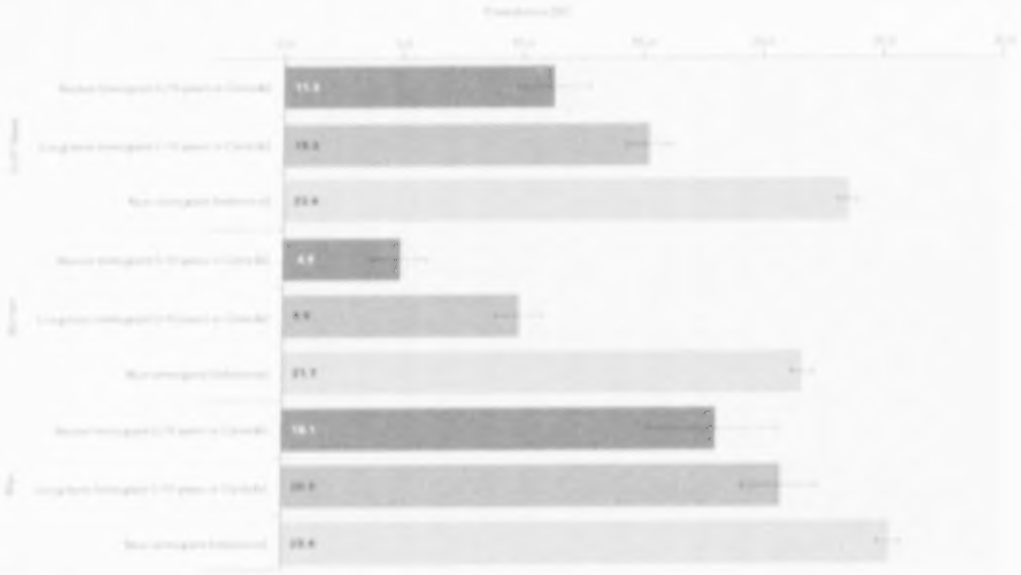
The prevalence of smoking and exposure to SHS in the home was significantly higher among non-immigrant adults than among both recent (≤10 years in Canada) and long-term (>10 years in Canada) adult immigrants. Among recent immigrants, the smoking prevalence was half (rate ratio [RR] = 0.5; 95% CI: 0.4–0.5) that of non-immigrant adults; among long-term immigrants, the prevalence was 0.6 (95% CI: 0.6–0.7) times that of non-immigrants.

Sex-specific inequalities in smoking were also noted. Among women who had recently immigrated to Canada, the prevalence of smoking was one-fifth that of non-immigrant women (RR = 0.2; 95% CI: 0.2–0.3). Among men who had recently immigrated, the prevalence was 0.7 (95% CI: 0.6–0.8) times that of non-immigrant men (Figure 3).

As with smoking, both recent and long-term immigrants had a lower prevalence of exposure to SHS in the home compared with non-immigrant adults. Compared with non-immigrant adults, SHS exposure was 0.7 (95% CI: 0.5–0.8) times among recent immigrants and 0.6 (95% CI: 0.4–0.8) times among long-term immigrants (Annex 2).

FIGURE 3

Smoking by Immigrant Status and Sex/Gender, Canada, ages 18+, 2010–2013



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
BOTH SEXES						
Recent Immigrant (≤10 years in Canada)	0.5*	−12.2*	NA	NA	NA	NA
Long-term Immigrant (>10 years in Canada)	0.6*	−8.3*	NA	NA	NA	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Recent Immigrant (≤10 years in Canada)	0.2*	−16.9*	NA	NA	NA	NA
Long-term Immigrant (>10 years in Canada)	0.5*	−11.8*	NA	NA	NA	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Recent Immigrant (≤10 years in Canada)	0.7*	−7.3*	NA	NA	NA	NA
Long-term Immigrant (>10 years in Canada)	0.8*	−4.5*	NA	NA	NA	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0

* Significantly different from reference category
NA: Non-applicable
Age standardization was performed using the 2011 Census of Population
Source: Canadian Community Health Survey (CCHS)–Annual Component (2010-2013)

Income

The prevalence of smoking and exposure to SHS in the home was almost twice as high, at 1.9 (95% CI: 1.8–1.9) times, among adults in the lowest income quintile compared with adults in the highest income quintile. A stepwise gradient was observed for both men and women: as income decreased, the prevalence of smoking increased, with slightly higher inequalities in smoking prevalence among women (Figure 4).

If smoking prevalence among adults in the lowest income quintile was as low as that among adults in the highest income quintile, there would be a 46.0% (95% CI: 43.4–48.7%) reduction in the proportion of adults who smoke and an 11.7% (95% CI: 10.8–12.5%) reduction in the proportion of adults who smoke nationally. This potential reduction would result in 674 220 (95% CI: 618 730–729 700) fewer adults smoking in Canada (Figure 4).

Similarly, from the lowest to the second-highest income quintile, there was a stepwise decrease in exposure to SHS in the home as income increased. However, there were no significant differences in the prevalence of exposure to SHS in the home between the highest and second highest income quintiles. The prevalence of exposure to SHS in the home among adults in the lowest income quintile was 1.7 (95% CI: 1.5–2.0) times the prevalence among adults in the highest income quintile.

If the prevalence of SHS exposure in the home among adults in the lowest income quintile was the same as that among adults in the highest income quintile, there would be a 42.4% (95% CI: 34.4–50.4%) reduction in this prevalence among adults in the lowest income quintile. Nationally, the result would be a reduction in the prevalence of SHS exposure of 8.9% (95% CI: 6.6–11.2%) and 83 100 (95% CI: 61 190–105 010) fewer adults exposed to SHS in the home (Annex 2).

Education (ages 20+ years)

Inequalities in both the prevalence of smoking and exposure to SHS in the home by level of education were significant. Smoking prevalence among adults with less than a high school education was 3.9 (95% CI: 3.6–4.1) times the prevalence among university graduates. Prevalence among both men and women decreased as level of education increased, with slightly higher inequalities observed among women (Figure 5).

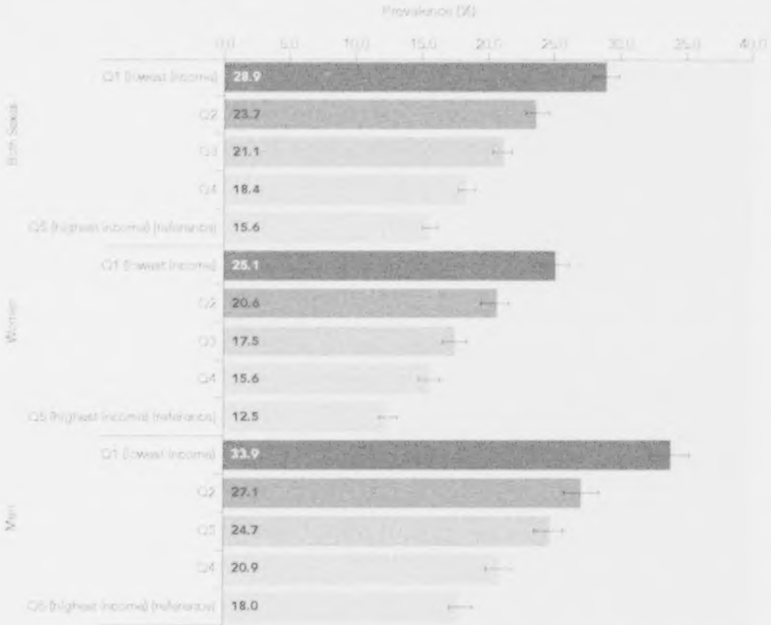
If the prevalence among adults with less than a high school education was the same as that of university graduates, there would be a 74.3% (95% CI: 72.6–76.0%) reduction in smoking prevalence among adults who had not completed high school. This would represent a 17.1% (95% CI: 16.3–17.9%) reduction in the prevalence of smoking nationally. As a result, there would be 993 560 (95% CI: 945 220–1041 890) fewer smokers in Canada (Figure 5).

Among adults with less than a high school education, exposure to SHS in the home was 4.0 (95% CI: 3.2–4.7) times that of university graduates.

If the prevalence of exposure to SHS for adults with less than a high school education was the same as the prevalence for adults with a university education, there would be a 74.8% (95% CI: 70.0–79.6%) reduction in SHS exposure among adults with less than a high school education. Nationally, this would represent an 18.2% (95% CI: 15.4–21.0%) decrease in exposure to SHS in the overall population and, potentially, 106 020 (95% CI: 132 960–187 070) fewer adults exposed to SHS in the home (Annex 2).

FIGURE 4

Smoking by Income Quintile and Sex/Gender, Canada, ages 18+, 2010–2013

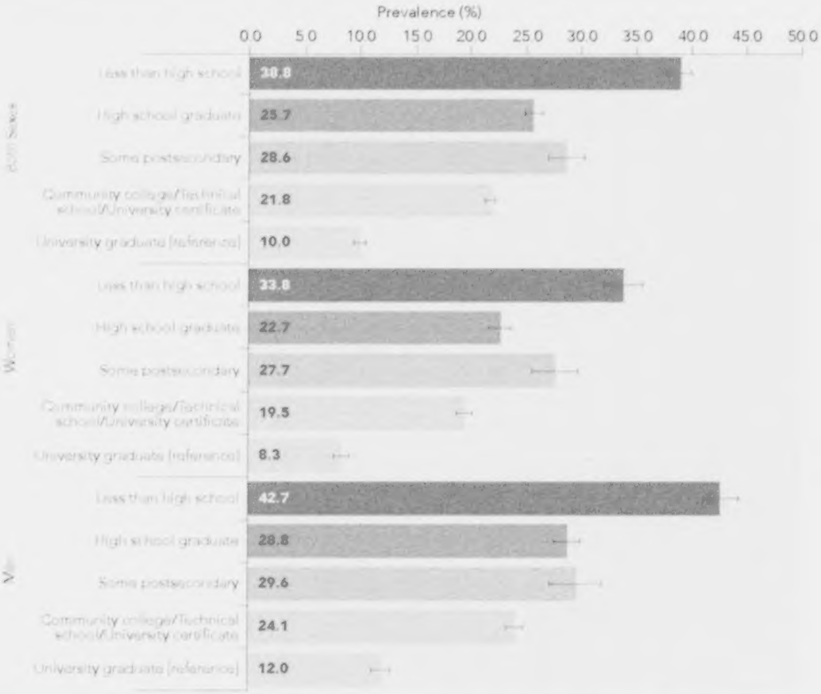


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
BOTH SEXES						
Q1 (lowest income)	1.9*	13.3*	46.0*	11.7*	2.5*	674 220*
Q2	1.5*	8.1*	34.3*	7.2*	1.5*	415 450*
Q3	1.4*	5.5*	26.2*	4.9*	1.1*	282 970*
Q4	1.2*	2.8*	15.2*	2.5*	0.5*	145 420*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Q1 (lowest income)	2.0*	12.6*	50.2*	14.6*	2.7*	369 820*
Q2	1.6*	8.1*	39.3*	8.7*	1.6*	221 280*
Q3	1.4*	5.0*	28.4*	5.0*	0.9*	126 950*
Q4	1.2*	3.1*	19.8*	3.1*	0.6*	77 220*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Q1 (lowest income)	1.9*	15.9*	46.9*	10.5*	2.6*	338 640*
Q2	1.5*	9.1*	33.6*	6.7*	1.6*	216 470*
Q3	1.4*	6.7*	27.0*	5.3*	1.3*	170 810*
Q4	1.2*	2.9*	13.7*	2.4*	0.6*	77 620*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Source: Canadian Community Health Survey (CCHS)–Annual Component (2010–2013)

FIGURE 5

Smoking by Education Level and Sex/Gender, Canada, ages 20+, 2010–2013



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
BOTH SEXES						
Less than high school	3.9*	28.8*	74.3*	17.1*	3.8*	993 560*
High school graduate	2.6*	15.7*	61.2*	12.2*	2.7*	711 610*
Some postsecondary	2.9*	18.7*	65.2*	4.9*	1.1*	285 000*
Community college/Technical school/ University certificate	2.2*	11.8*	54.3*	19.5*	4.3*	1 132 610*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Less than high school	4.1*	25.5*	75.4*	17.0*	3.3*	443 790*
High school graduate	2.7*	14.4*	63.3*	12.9*	2.5*	337 030*
Some postsecondary	3.3*	19.4*	70.0*	5.6*	1.1*	145 940*
Community college/Technical school/ University certificate	2.3*	11.2*	57.4*	20.8*	4.1*	542 250*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Less than high school	3.6*	30.8*	72.0*	16.4*	4.1*	525 340*
High school graduate	2.4*	16.8*	58.4*	11.4*	2.9*	365 640*
Some postsecondary	2.5*	17.6*	59.5*	4.3*	1.1*	136 470*
Community college/Technical school/ University certificate	2.0*	12.1*	50.4*	18.0*	4.5*	574 490*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0

* Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Source: Canadian Community Health Survey (CCHS)–Annual Component (2010–2013)

Employment Status and Occupation

The prevalence of smoking and exposure to SHS in the home was higher among adults in unskilled occupations than among adults in professional occupations. Similarly, smoking and SHS exposure prevalence among adults permanently unable to work was much higher than among employed adults (Figure 6).

The prevalence of smoking among adults in unskilled occupations was 2.6 (95% CI: 2.4–2.9) times the prevalence among adults in professional occupations. A gradient in smoking prevalence was also evident by occupational status, with higher prevalence among unskilled workers than among those in professional occupations. Rate ratios for semiskilled workers, skilled/technical/supervisors, and managers were, respectively, 2.4 (95% CI: 2.2–2.6) times, 2.1 (95% CI: 1.9–2.3) times, and 1.8 (95% CI: 1.6–1.9) times that of adults in professional occupations.

If the prevalence of smoking among adults employed in unskilled occupations was the same as the prevalence among adults employed in professional occupations, there would be a 62.0% (95% CI: 58.5–65.4%) reduction in the prevalence of smoking among adults in unskilled occupations. This would represent 306 810 fewer smokers (95% CI: 277 240–336 380) in Canada.

If smoking prevalence among adults in semiskilled professions was the same as the prevalence among those in professional occupations, there would be a 57.5% (95% CI: 53.9–61.2%) reduction in the prevalence of smoking among adults in semiskilled occupations. This would, potentially, equate to 671 530 fewer smokers (95% CI: 616 760; 726 300) in Canada (Figure 6).

The relative inequalities in exposure to SHS in the home by occupational status were similar to those for smoking. Compared with people in professional occupations, exposure to SHS in the home was 2.5 (95% CI: 1.8–3.2) times higher among unskilled workers; 2.2 (95% CI: 1.6–2.8) times higher among semiskilled workers; and 1.8 (95% CI: 1.3–2.2) higher among skilled/technical/supervisors (Figure 6).

Among adults who were permanently unable to work, the smoking prevalence was 1.8 (95% CI: 1.7–1.9) times as high as the prevalence among employed adults (Annex 1).

If the prevalence of smoking among adults who were permanently unable to work was the same as the prevalence among employed adults, there would be a 44.6% (95% CI: 40.9–48.2%) reduction in smoking prevalence among those permanently unable to work. This would, potentially, represent 125 950 (95% CI: 107 700–144 910) fewer adult smokers in Canada.

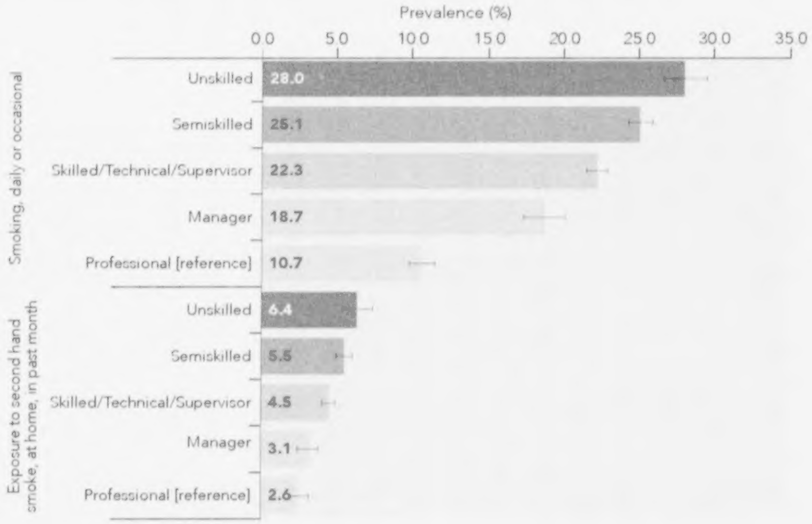
Similarly, smoking prevalence among adults who had no job in the previous week (but who had been looking for work in the past four weeks) was 1.6 (95% CI: 1.5–1.7) times that of adults who were currently employed. If the prevalence of smoking among those with no job in the previous week (but were looking for work in the past 4 weeks) was the same as that of employed adults, there would be a 35.5% (95% CI: 31.2–39.8%) reduction in this prevalence among those with no job in the previous week. This would, potentially, represent 132 150 (95% CI: 107 730–156 580) fewer smokers in Canada (Annex 2).

The relative inequalities for SHS exposure in the home by employment status were greater than the inequalities in smoking. Among adults who were permanently unable to work, the prevalence of exposure to SHS in the home was 2.2 (95% CI: 1.7–2.6) times that of employed adults (Annex 2).

If prevalence of SHS exposure in the home among adults who were permanently unable to work was the same as the prevalence among employed adults, there would be a 54.0% (95% CI: 43.9–64.1%) reduction in SHS exposure among adults permanently unable to work. This potential risk reduction represents 24 970 (95% CI: 14 980–34 960) fewer people exposed to SHS in Canada (Annex 2).

FIGURE 6

Smoking and Exposure to Second-Hand Smoke in the Home by Occupation, Canada, ages 18–75 years, 2010–2013



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
SMOKING						
Unskilled	2.6*	17.4*	62.0*	6.1*	1.4*	306 810*
Semiskilled	2.4*	14.4*	57.5*	13.3*	3.0*	671 530*
Skilled/Technical/Supervisor	2.1*	11.6*	52.2*	13.8*	3.1*	701 040*
Manager	1.8*	8.1*	43.1*	2.9*	0.7*	148 500*
Professional [reference]	1.0	0.0	0.0	0.0	0.0	0
EXPOSURE TO SECOND-HAND SMOKE						
Unskilled	2.5*	3.8*	59.9*	6.0*	0.3*	48 140*
Semiskilled	2.2*	3.0*	53.7*	12.7*	0.6*	102 210*
Skilled/Technical/Supervisor	1.8*	1.9*	42.9*	11.1*	0.5*	88 730*
Manager	1.2	0.5	16.7	1.0	0.0	7 660
Professional [reference]	1.0	0.0	0.0	0.0	0.0	0

* Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Source: Canadian Community Health Survey (CCHS)-Annual Component (2010-2013)

Rural/Urban Residence

Prevalence of smoking was highest among adults living in remote areas and lowest among adults living in Toronto, Montréal, and Vancouver[44]. Among adults living in remote areas, smoking prevalence was 1.3 (95% CI: 1.2–1.3) times the prevalence among adults living in large urban centres other than Toronto, Montréal, or Vancouver. The prevalence was lowest in these three urban centres, at 0.9 (95% CI: 0.9–0.9) times that of adults living in other large urban centres (Annex 1).

The relative inequalities in SHS exposure in the home by rural/urban residence were higher: 1.7 times (95% CI: 1.5–1.9) as high among adults living in provincial rural areas and 1.5 times (95% CI: 1.4–1.7) as high among adults living in remote areas compared with adults living in large urban centres other than Toronto, Montréal, and Vancouver (Annex 2).

DATA GAPS/LIMITATIONS

Results for prevalence of smoking and exposure to SHS in the home were drawn from the CCHS, which relies on self-reported data that may be subject to recall and social desirability biases. As with other national surveys, another general limitation of the CCHS sample is that a number of populations for which smoking prevalence is generally higher than for the general population—such as people living in institutions, on First Nations reserves, and in Nunavik—are excluded (23).

The data for smoking prevalence do not include cigarette consumption volumes or quitting (intention and attempts)—two variables that are socially patterned and strongly associated with lung cancer risk. Data for SHS exposure pertain only to exposure in the home and do not take into account exposure to SHS in vehicles, the workplace, or public places, settings that may be subject to public health regulation. The survey question used to ascertain SHS exposure in the home is also limited, as the period of exposure was restricted to the preceding month.

Inequalities in lung cancer incidence rates are reported using area-based measures to define social groups. Area-based measures are aggregated at the dissemination area level and rely on the assumption that socioeconomic and demographic groups are uniform. These important limitations may lead to misclassification bias and an underestimation of the inequalities in lung cancer incidence rates. Although the directions of disparities between studies using area-based and individual-level measures may be the same, research shows that the size of the disparities varies and is much larger when measured at the individual level (24). Area-based measures derived from linking postal codes may also attenuate estimates in rural areas; because rural postal codes cover larger geographical areas, they are less precise in determining dissemination areas. (For more information, see area-based measures.)

Given that the data are cross-sectional, it is not possible to infer causality. The intent was to capture the magnitude and direction of inequalities in smoking prevalence, exposure to SHS in the home, and lung cancer incidence rates among different socioeconomic and sociodemographic groups. However, in reality, these inequalities are driven by a complex and multidirectional system of individual, social, and structural drivers of health that have yet to be fully explored and understood.

Also, although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (15), calculating *p*-values would confirm statistically significant differences.

Finally, the social groupings used in this analysis are defined in broad categories that are presumed to be distinct and homogeneous. Consequently, the inequalities facing people and communities who hold multiple and intersecting identities are not captured here. Also, the results also do not capture the true heterogeneous nature of the stratifier groups themselves. For example, lung cancer incidence rates vary

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[44] For definitions of rural/urban subgroups, see the Methodology chapter.

BOX 1
RELATED INDICATOR: LUNG CANCER INCIDENCE IN CANADA

Lung cancer is the most commonly diagnosed malignancy in Canada. Each year, 28 400 Canadians are diagnosed with the disease (3). Lung cancer is also the leading cause of cancer-related deaths in Canada (3). Survival for lung cancer remains poor, with only 17% surviving 5 years after diagnosis. Despite this large impact, the incidence rate among men has been declining since the late 1980s and, as of 2006, has plateaued among women (3). Sex/gender-specific differences in lung cancer incidence rates reflect historical differences in smoking prevalence and practices (16). Lower socioeconomic status has been consistently associated with a higher incidence of lung cancer (17,18,19). While smoking prevalence has declined among all socioeconomic status groups in Canada over the last 50 years, these decreases have been much larger among affluent and better educated adults (12).

Methods

Lung cancer incidence data for the period 2008–2010 were obtained from the Canadian Cancer Registry (CCR). As few individual-level demographic and socioeconomic details are available from administrative data sources such as the CCR, area-based measures were derived at the dissemination area level, using data from the 2006 Canadian Census of Population, to provide measures of inequality across social stratifiers. Consequently, the following findings apply at the dissemination area level and not at the individual level. (For more information, see area-based measures).

Inequalities in lung cancer incidence rates were assessed by measuring differences by age, sex/gender, and by six area-based social stratifiers: income, education, immigrant status, Indigenous identity, rural/urban residence, and social and material deprivation[45]. Differences in social and material deprivation were obtained using residential postal code data from the CCR. Analysis included people 18 years and older, and data were standardized by age using the 2011 Census of Population. As for smoking and exposure to SHS, inequality measures were reported along with their 95% CIs (15), and sex/gender-specific inequalities for the area-based measures were reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: rate ratio (RR), rate difference, attributable fraction, population attributable risk, population attributable fraction, and population impact number.

Key Findings

In areas with a high concentration of people who identified as Inuit, First Nations, or Métis, the incidence rates for lung cancer were higher than in areas with a low concentration of adults who identified as Indigenous. In predominantly Inuit areas, the rate was 2.6 (95% CI: 2.0–3.4) times as high; in areas with predominantly First Nations, 1.7 (95% CI: 1.5–1.8) as high; and in areas with predominantly Métis people, 1.4 (95% CI: 1.2–1.6) times as high (Figure 7). The rapid increase in lung cancer incidence among Indigenous adults has been attributed to the high prevalence of cigarette smoking in both sexes (20,21).

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45. For a definition of the deprivation index, see the Methodology chapter

One of the highest inequalities in lung cancer incidence was seen in areas with a high concentration of Inuit (178.4 per 100 000 compared to 69.0 per 100 000 in areas with a low concentration of people identifying as First Nations, Inuit, or Métis).

Adults living in the lowest-income areas had an incidence rate for lung cancer that was 1.7 (95% CI: 1.7–1.7) times that of adults living in the highest-income areas (Figure 8). The incidence rate was also high among adults living in areas with the lowest level of education, at 1.5 (95% CI: 1.5–1.6) times that of adults living in areas with the highest level of education (Figure 9).

If the incidence rate among adults living in the lowest education and income areas was the same as the rate among adults living in the highest education and income quintiles, there would be, respectively, 2 015 (95% CI: 1 876–2 156) and 2 326 (95% CI: 2 190–2 464) fewer new cases of lung cancer, on average, per year.

Incidence rates for both income and education decreased from lowest to highest income quintile, with more pronounced inequalities in rates among men than among women (Figures 8–9). The relationship between lung cancer incidence and household income and educational attainment was inverse—as income and educational level increased, the incidence rate of lung cancer decreased.

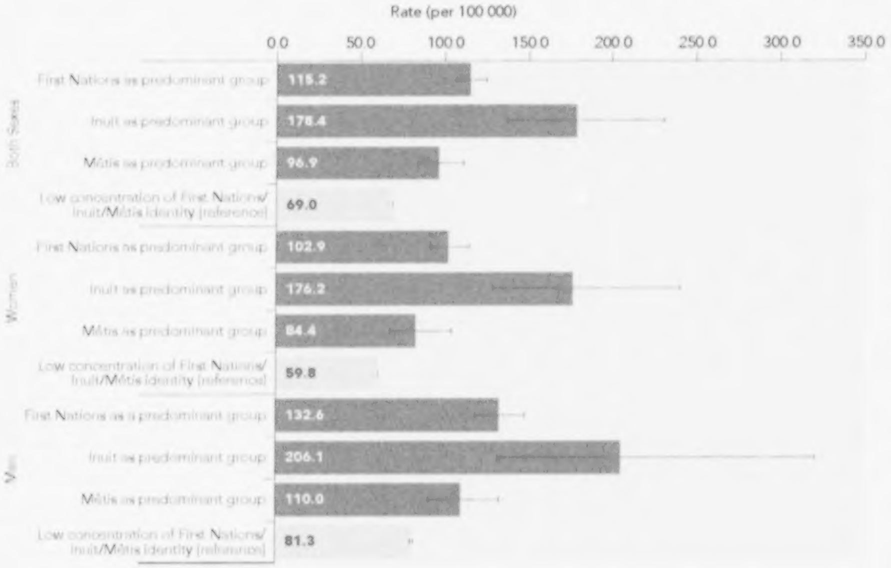
In areas with a low concentration of foreign-born residents, the lung cancer incidence rate was 1.6 (95% CI: 1.6–1.7) times the rate in areas with a high concentration of foreign-born residents. This corresponds to 75.1 (95% CI: 74.4–75.7) cases per 100 000 in areas with a low concentration of foreign-born residents compared with 46.7 (95% CI: 45.4–48.1) cases per 100 000 in areas with a high concentration of foreign-born residents (Annex 3).

If the incidence rate among adults living in areas with a low concentration of foreign-born residents was the same as among adults living in areas with a high concentration of foreign-born residents, an average of 6 893 cases of lung cancer per year could have been prevented between 2008 and 2010.

The lung cancer incidence rate among people living in remote areas was 1.2 (95% CI: 1.2–1.3) times as high as the rate among adults living in large urban centres (with the exception of Toronto, Montréal, and Vancouver) (Annex 3). Other population-based studies show that the lung cancer incidence rate among adults living in rural and remote areas is also higher compared with the incidence rate among adults living in urban areas. The higher rates of cigarette smoking in rural and remote areas may be an explanation for this finding (22).

FIGURE 7

Lung Cancer Incidence Rate by Indigenous Identity and Sex/Gender, 18+ years, Canada, 2008–2010

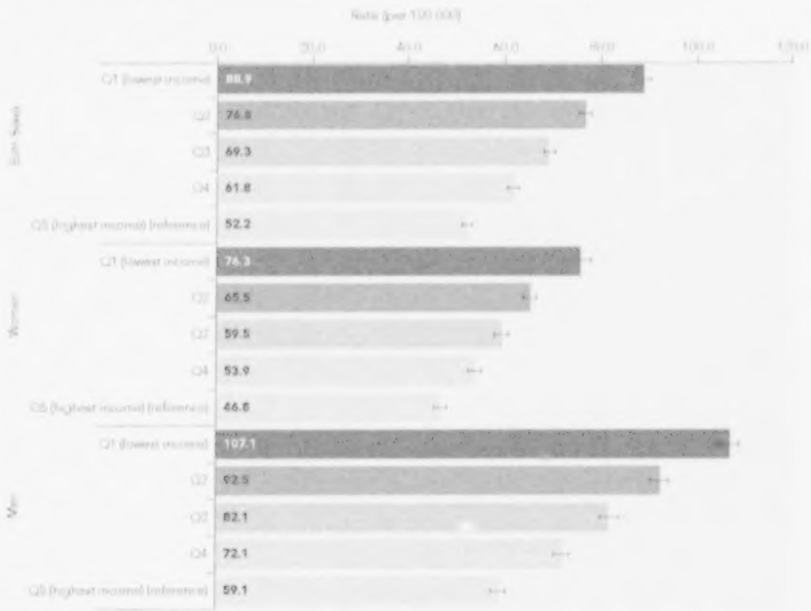


	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
BOTH SEXES						
First Nations as predominant group	1.7*	46.2*	40.1*	0.4*	0.3*	92*
Inuit as predominant group	2.6*	109.4*	61.3*	0.1*	0.1*	18*
Métis as predominant group	1.4*	27.9*	28.8*	0.1*	0.1*	18*
Low concentration of First Nations/ Inuit/Métis identity [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
First Nations as predominant group	1.7*	43.1*	41.9*	0.4*	0.3*	45*
Inuit as predominant group	2.9*	116.4*	66.1*	0.1*	0.1*	10*
Métis as predominant group	1.4*	24.6*	29.1*	0.1*	0.0*	8*
Low concentration of First Nations/ Inuit/Métis identity [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
First Nations as predominant group	1.6*	51.3*	38.7*	0.4*	0.3*	47*
Inuit as predominant group	2.5*	124.8*	60.6*	0.1*	0.1*	9*
Métis as predominant group	1.4*	28.7*	26.1*	0.1*	0.1*	9*
Low concentration of First Nations/ Inuit/Métis identity	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Area-level measures of Indigenous identity derived from the 2006 Census of Population
Predominant group: ≥ 33% of residents in dissemination area report Indigenous identity with majority belonging to indicated group
Source: Canadian Cancer Registry (2008–2010)

FIGURE 8

Lung Cancer Incidence Rate by Income Quintile and Sex/Gender, 18+ years, Canada, 2008–2010

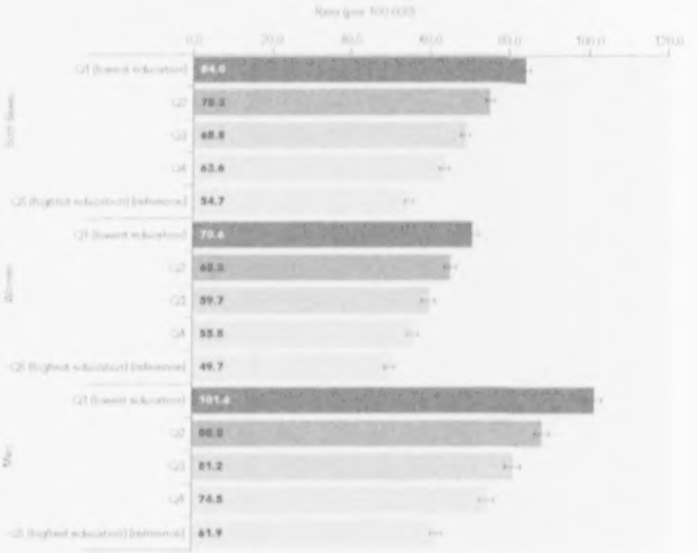


	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
BOTH SEXES						
Q1 (lowest income)	1.7*	36.7*	41.3*	10.0*	7.1*	2 326*
Q2	1.5*	24.6*	32.0*	7.3*	5.2*	1 697*
Q3	1.3*	17.1*	24.7*	4.9*	3.5*	1 150*
Q4	1.2*	9.6*	15.5*	2.8*	2.0*	644*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Q1 (lowest income)	1.6*	29.5*	38.7*	9.5*	6.2*	1 035*
Q2	1.4*	18.7*	28.6*	6.4*	4.2*	700*
Q3	1.3*	12.7*	21.3*	4.2*	2.7*	459*
Q4	1.2*	7.1*	13.2*	2.3*	1.5*	253*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Q1 (lowest income)	1.8*	48.0*	44.8*	10.7*	8.3*	1 327*
Q2	1.6*	33.4*	36.1*	8.3*	6.4*	1 028*
Q3	1.4*	23.0*	28.0*	5.7*	4.4*	704*
Q4	1.2*	13.0*	18.0*	3.2*	2.5*	401*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Area-level measures of income quintiles derived from the 2006 Census of Population
Source: Canadian Cancer Registry (2008–2010)

FIGURE 9

Lung Cancer Incidence Rate by Education Level, 18+ years, and Sex/Gender, Canada, 2008–2010



	RATE RATIO (RR)	RATE DIFFERENCE (RD) PER 100 000	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100 000	POPULATION IMPACT NUMBER (PIN)
BOTH SEXES						
Q1 (lowest education)	1.5*	29.3*	34.9*	8.6*	6.1*	2 015*
Q2	1.4*	20.5*	27.3*	5.9*	4.2*	1 377*
Q3	1.3*	14.1*	20.5*	4.0*	2.9*	940*
Q4	1.2*	8.9*	14.0*	2.5*	1.8*	582*
Q5 (highest education) [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Q1 (lowest education)	1.4*	20.9*	29.6*	7.0*	4.5*	757*
Q2	1.3*	15.5*	23.8*	5.1*	3.3*	557*
Q3	1.2*	10.0*	16.8*	3.3*	2.1*	359*
Q4	1.1*	6.1*	10.9*	2.0*	1.3*	216*
Q5 (highest education) [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Q1 (lowest education)	1.6*	39.7*	39.1*	10.1*	7.8*	1 258*
Q2	1.4*	26.6*	30.1*	6.5*	5.1*	815*
Q3	1.3*	19.3*	23.8*	4.7*	3.6*	581*
Q4	1.2*	12.6*	16.9*	3.0*	2.3*	369*
Q5 (highest education) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population
Area level measures of education level derived from the 2006 Census of Population
Source: Canadian Cancer Registry (2008–2010)

significantly between immigrant populations from different countries, which reflect underlying differences in smoking, diet, and other risk factors by country of origin. Comparing the immigrant population as a whole to the non-immigrant population does not capture the nuances of inequality within and between different immigrant populations. As such, this can lead to an over- or underestimation of the health burden these groups face (25).

DISCUSSION

Smoking is a leading cause of death in high-income countries such as Canada and is a major risk factor for cardiovascular disease and many cancers. While smoking prevalence has been declining in the overall population (ages 12+ years), from 23.4% in 2003 to 18.5% in 2014, this trend may hide important socioeconomic inequalities (26). From 1950 to 2011, smoking inequalities between socioeconomic status groups in Canada have been gradually widening, with increased uptake of smoking among people with lower socioeconomic status (12,23).

Results by sex/gender show that although the prevalence of exposure to SHS in the home was similar for men and women, smoking and lung cancer incidence rates were higher among men. Among men, the smoking prevalence was 24.2% compared with 18.3% among women; the lung cancer incidence rate was 80.3 per 100 000 versus 59.2 per 100 000 among women. Rates of smoking and exposure to SHS in the home were inversely related to income, education, and occupation, with inequalities particularly pronounced by educational attainment. For example, while rates of smoking and exposure to SHS in the home were almost twice as high among adults in the lowest income quintile compared with adults in the highest income quintile, the prevalence of smoking and exposure to SHS in the home was, respectively, 3.9 and 4.0 times as high among adults with less than high school education as the prevalence among university graduates. This finding is consistent with previous research that showed education to be the socioeconomic status variable that correlates most strongly with smoking. Likewise, Canadian research that examined exposure to SHS in the home (in the past month, any source) found that people in the three lowest income quintiles had the same odds of exposure to SHS in the home as the reference group (upper middle income), but greater odds of exposure than the highest income group (14). Other Canadian research also found a stepwise gradient of exposure that increased as the level of education decreased (27).

The pattern of socioeconomic status-based inequalities in smoking and SHS exposure is similar to lung cancer incidence by education and income. People living in areas with the lowest incomes and with the lowest education levels had a lung cancer incidence rate 1.7 and 1.5 times that of people living in areas with the highest incomes and education levels. (Data for occupation were not available for lung cancer incidence rates.) Lung cancer risk is inversely associated with socioeconomic status and may be largely explained by differences in smoking and exposure to SHS as well as by diet, environment, and occupation (17-19,28).

These socioeconomic status-based inequalities in smoking prevalence are similar to the patterns observed in other industrialized countries, including the United States of America (USA), Australia, New Zealand, and many European countries (29). In the USA, the prevalence of smoking decreased as education level increased: 25% of people with less than a high school diploma, 26% of those who had completed high school, 19% of those with some college education, and 7% of those with a bachelor's degree or higher (30). In Australia, people with the lowest socioeconomic status were almost 3 times more likely to be daily smokers than those with the highest socioeconomic status (31). Similar findings were noted in New Zealand, where people living in the most socioeconomically deprived areas were about 3 times more likely to smoke than people living in least deprived areas (32). In England, 36–40% of people in the two lowest income quintiles smoked compared with 17–18% of people in the highest income quintiles (33).

Globally, the estimated exposure to SHS in the home is much higher than that reported in this chapter, primarily because of how exposure to SHS was defined. While absolute comparisons in SHS exposure in the home can be difficult to make due to the different techniques used to assess SHS exposure, many countries have reported significant inequalities in exposure to SHS. For example, SHS exposure has been associated with low income in both the USA (34) and Australia (35).

Inequalities in smoking and exposure to SHS in the home were higher among adults who worked in unskilled occupations than in adults in professional occupations. The finding was the same among adults who were permanently unable to work compared with employed adults. Another Canadian study that examined self-reported SHS exposure from any source in the past month found higher rates of exposure among unemployed adults compared with employed adults (14). In England, adults in occupations labelled "routine and manual" had the highest percentage of smokers in 2013 (29%) compared with adults in the "intermediate" classification (18%) and in "managerial and professional" occupations (14%) (33). In Australia, unemployed adults had a smoking prevalence 1.7 times as high as employed adults, while the prevalence among adults unable to work was more than twice as high (RR = 2.4) (31).

Indigenous people in Canada had considerably higher inequalities in the rates of smoking, SHS exposure in the home, and lung cancer incidence. These results are consistent with previous research that showed the prevalence of smoking and exposure to SHS in the home to be much higher among Indigenous people than non-Indigenous people, with smoking rates particularly high among Inuit and First Nations peoples living on and off reserve (20,21,36,37). Moreover, almost two-thirds of Inuit smoked every day, a proportion that is 3 times that of non-Indigenous Canadians (20). Smoking initiation may also explain the high rates of lung cancer among Inuit: in 2012, daily smokers who identified as Inuit reported they had started to smoke at age 15 or younger (36). One study found that Inuit living in the USA (primarily Alaska), Canada (mainly Northwest Territories and Nunavut), and Denmark/Greenland have the highest incidence rate of lung cancer in the world, with Nunavut the highest of all regions and countries (44).

Smoking prevalence was also higher among certain Indigenous peoples than non-Indigenous people in other industrialized countries. Among Indigenous peoples in Australia, prevalence was 2.5 times as high as among non-Indigenous Australians (31). Maori New Zealanders were 2.7 times more likely to be current smokers (smoking at least monthly) than non-Maori New Zealanders (32). In New Zealand, there were differences in exposure to SHS in the home between Indigenous and non-Indigenous populations: 16% of Maori respondents compared with 7.9% of non-Maori respondents reported being exposed to SHS every day for the 7 days prior to the survey (45).

Smoking and exposure to SHS in the home was less common among immigrants than among non-immigrants. This is consistent with findings that showed that people living in areas with a low percentage of foreign-born residents had a lung cancer incidence rate that was 1.6 times that of people living in areas with a high percentage of foreign-born residents.

While rates of smoking and exposure to SHS were higher among White adults than among other cultural/racial groups, these results should be interpreted with caution. Although the research in Canada on exposure to SHS in the home by cultural or racial background is minimal, research based on CCHS data found that 22.2% of visible minorities who had never smoked reported being exposed to SHS from any source compared with 26.3% of White people who have never smoked and who reported being exposed to SHS (14). Similarly, research in New Zealand found that non-Asians in New Zealand were more likely to be current smokers (smoking at least monthly) than Asians (32).

BOX 2

FOCUS ON FIRST NATIONS PEOPLE LIVING ON RESERVE AND IN NORTHERN COMMUNITIES–CONTEXTUALIZING RESULTS FROM THE FIRST NATIONS REGIONAL HEALTH SURVEY

Prepared by the First Nations Information Governance Centre

In First Nations culture, tobacco is a sacred medicine that can be used to communicate with the spirit world, give thanks to the Creator, and heal the body. While tobacco can be inhaled through a pipe, cultural practices mainly involve using tobacco by giving it as a gift, or by placing it in fire, on water, or on the ground (38,39). Despite the medicinal and spiritual significance of tobacco, it also impacts First Nations peoples' present-day vulnerability for cigarette smoke exposure, and subsequent incidences of lung cancer. This is due to generations of historic colonial policies that condemned First Nations peoples' cultural practices, including their use of sacred medicines (39). Policies such as the construction of reserves and the *Indian Act* displaced First Nations people from their land and restricted them from engaging in their traditional lifestyle that would provide their communities with economic sustenance (40). No longer able to cultivate or grow their own tobacco, First Nations people were forced to rely on the supply of commercial tobacco from European traders (40). However, industrialized commercial tobacco products, such as recreational cigarettes, contain other addictive and carcinogenic additives that promote harmful misuse when consumed in non-traditional ways (41). The desire for First Nations people to reconnect with their cultural practices and the continued influence of Western uses of commercial tobacco are a source of conflict for many present-day First Nations people (38). Further, the remote and/or rural setting as well as diminished economic resources in many communities also create barriers for socioeconomic development, including accessible health care services that could help to prevent or mitigate smoking behaviours and aid in the early detection of lung cancer (42). In addition to financial and geographic barriers to health care services, smoking prevention initiatives are commonly not readily accessible to First Nations people, as they are centred on Western concepts of health. A holistic approach to these initiatives would be culturally relevant and resonate with First Nations people as it would take into account historical trauma, the concept of family and community, and the socioeconomic conditions of communities (43).

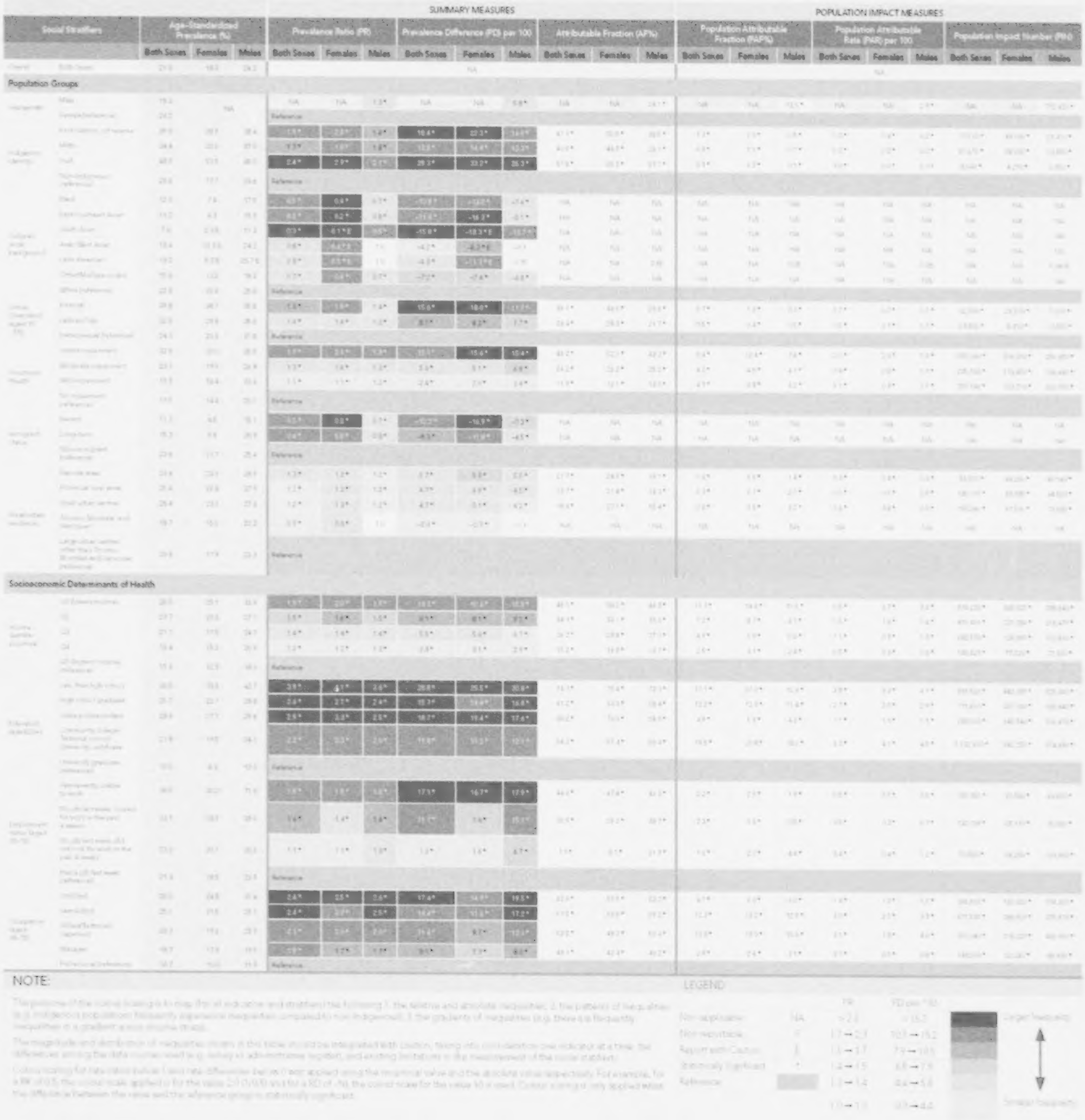
Rates of smoking prevalence and SHS exposure in the home were also higher among people living in rural areas than among those living in large urban centres other than Toronto, Montréal, and Vancouver. This is similar to the rates for lung cancer incidence: people living in rural areas had a rate of lung cancer incidence 1.2 times as high as the rate for people living in large urban centres (except Toronto, Montréal, and Vancouver). In Australia, people living in remote areas were twice as likely to smoke as people living in major cities; the more remote the location, the higher the smoking prevalence (31). In the USA, 15% of people living in large metropolitan statistical areas and 18% living in small metropolitan statistical areas smoked compared with 24% of people living outside of metropolitan statistical areas (30).

Differences by sexual orientation were observed in prevalence for smoking but not in prevalence for exposure to SHS in the home. Research from Australia also found that homosexual or bisexual people were more likely to smoke daily than those who identified as heterosexual (31).

Smoking and exposure to SHS adversely affect many Canadians, linked as they are to a number of health conditions, including many cancers, cardiovascular diseases, diabetes, and respiratory illnesses (2). The higher prevalence of smoking and exposure to SHS and higher incidence of lung cancer are evident across a range of social stratifiers, including occupation type, employment status, and Indigenous identity. The higher prevalence of smoking and exposure to SHS in some populations is strongly influenced by social determinants of health, including income, education, job opportunities, intergenerational trauma, discrimination, and marginalization (6,42). Similarly, smoking prevalence and lung cancer incidence follows a socioeconomic gradient, with rates increasing as incomes and education levels decrease. These broader social, economic, and environmental conditions, driven by complex social and structural drivers of health, have a great impact on the disproportionate health burden of smoking and exposure to SHS.

The systematic measurement of health inequalities of Canadian adults helps to inform and strengthen interventions to reduce the revealed differences and related impacts. However, fully addressing these inequalities will also require policy interventions, including those that tackle exposure to SHS in the home and in private vehicles (13,14), as well as those that are associated with sociodemographic factors such as province/territory of residence, younger ages, non-immigrant status, receiving social assistance, and living in households with no children younger than 12 years old (14). To this end, the ongoing monitoring of these health inequalities across sociodemographic and socioeconomic groups will inform how these are changing over time and further inform interventions, programs, policies, and research.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Smoking.
Data Source: CCHS 2010–2013


SUMMARY MEASURES
POPULATION IMPACT MEASURES
Social Stratifiers
Age-Standardized Prevalence (%)
Prevalence Ratio (PR)
Prevalence Difference (PD) per 100
Attributable Fraction (AF%)
Population Attributable Fraction (PAF%)
Population Attributable Rate (PAR) per 100
Population Impact Number (PIN)
Both Sexes
Females
Males
Population Groups
Socioeconomic Determinants of Health
NOTE:
LEGEND
Non-applicable NA
Non-reportable F
Report with Caution E
Statistically Significant *
Reference
PR
PD per 100
Larger Inequality
Smaller Inequality

Annex 2. Absolute and Relative Inequalities, and Population Impact Measures for Exposure to Secondhand Smoke at home. Data Source: CCHS 2010–2013

					SUMMARY MEASURES									POPULATION IMPACT MEASURES								
Social Stratifiers		Age-Standardized Prevalence (%)			Prevalence Ratio (PR)			Prevalence Difference (PD) per 100			Attributable Fraction (AF%)			Population Attributable Fraction (PAF%)			Population Attributable Rate (PAR) per 100			Population Impact Number (PIN)		
		Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males
Overall	Both Sexes	4.4	4.2	4.5	NA									NA								
Population Groups																						
Sex/gender	Male	4.5	NA		NA	NA	1.1	NA	NA	0.3	NA	NA	6.6	NA	NA	3.2	NA	NA	0.1	NA	NA	29,910
	Female (reference)	4.2			Reference																	
Indigenous Identity	First Nations, off reserve	8.5	8.7	8.6	2.0 *	2.1	1.9 *	4.2 *	4.5	4.1 *	49.6 *	52.1	48.2 *	1.1 *	1.2	1.1 *	0.0 *	0.1	0.0 *	10,260 *	5,750	4,780 *
	Métis	6.0	5.7 E	6.5	1.4 *	1.4 E	1.5	1.7 *	1.6 E	2.0	28.4 *	27.2 E	31.1	0.4 *	0.4 E	0.5	0.0 *	0.0 E	0.0	4,010 *	1,980 E	2,170
	Inuit	8.4 E	F	12 E	2.0 E	F	2.7 E	4.1 E	F	7.6 E	48.8 *E	F	62.9 E	0.1 E	F	F	0.0 E	F	F	510 E	F	F
	Non-Indigenous (reference)	4.3	4.2	4.5	Reference																	
Cultural/racial background	Black	2.9 E	3.1 E	2.7 E	0.6 * E	0.7 E	0.5 * E	–1.7 * E	–1.1 E	–2.3 * E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	East/Southeast Asian	3.1	4.0	1.7 E	0.7 *	1.0	0.3 * E	–1.5 *	–0.2	–3.3 * E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	South Asian	2.2 E	2.5 E	1.8 E	0.5 * E	0.6 * E	0.4 * E	–2.4 *E	–1.7 * E	–3.2 * E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Arab/West Asian	4.6 E	5.9 E	3.4 E	1.0 E	1.4 E	0.7 E	0.0 E	1.7 E	–1.6 E	NA	28.4 E	NA	NA	0.6 E	NA	NA	0.0 E	NA	NA	2,890 E	NA
	Latin American	2.9 E	3.0 E	F	0.6 * E	0.7 E	F	–1.8 * E	–1.2 E	F	NA	NA	F	NA	NA	F	NA	NA	F	NA	NA	F
	Other/Multiple origins	2.2 E	2.5 E	1.9 E	0.5 * E	0.6 * E	0.4 * E	–2.4 * E	–1.7 * E	–3.2 * E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	White (reference)	4.6	4.2	5.1	Reference																	
Sexual orientation (aged 18 – 59)	Bisexual	4.8 E	5.3 E	4.3 E	1.1 E	1.2 E	0.9	0.2 E	0.8 E	–0.4	5.2 E	15.7 E	NA	0.0 E	0.2 E	NA	0.0 E	0.0 E	NA	300 E	700 E	NA
	Lesbian/Gay	5.5	4.9 E	5.9 E	1.2	1.1 E	1.2	0.9	0.4 E	1.2	16.2	7.6 E	19.9	0.2	0.1 E	0.4	0.0	0.0 E	0.0	1,590	270 E	1,260
	Heterosexual (reference)	4.6	4.5	4.7	Reference																	
Functional Health	Severe impairment	6.1	5.9	6.3	1.6 *	1.6 *	1.7 *	2.4 *	2.1 *	2.6 *	39.3 *	36.5 *	41.9 *	6.6 *	6.7 *	6.3 *	0.3 *	0.3 *	0.3 *	62,180 *	32,300 *	29,150 *
	Moderate impairment	5.2	5.2	5.3	1.4 *	1.4 *	1.5 *	1.6 *	1.5 *	1.7 *	29.8 *	28.4 *	31.4 *	5.4 *	5.5 *	5.4 *	0.2 *	0.2 *	0.2 *	51,030 *	26,480 *	24,670 *
	Mild impairment	4.1	3.8	4.4	1.1	1.0	1.2	0.4	0.1	0.7	9.4	1.7	16.5	4.0	0.7	7.1	0.2	0.0	0.3	37,210	3,390	32,610
	No impairment (reference)	3.7	2.7	3.7	Reference																	
Immigrant status	Recent	3.1	3.6 E	2.3 E	0.6 *	0.8 E	0.5 *	–1.7 *	–0.8 E	–2.9 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Long-term	3.2	3.7	2.6 E	0.7 *	0.8	0.5 *	–1.6 *	–0.7	–2.6 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Non-immigrant (reference)	4.8	4.4	5.2	Reference																	
Rural/urban residence	Remote areas	5.9	5.3	6.6	1.4 *	1.5 *	1.6 *	2.2 *	1.7 *	2.6 *	36.3 *	32.7 *	38.9 *	2.8 *	2.3 *	3.3 *	0.1 *	0.1 *	0.2 *	26,160 *	10,800 *	15,160 *
	Provincial rural areas	6.5	5.8	7.2	1.7 *	1.6 *	1.8 *	2.7 *	2.2 *	3.2 *	41.6 *	38.7 *	43.8 *	6.2 *	5.2 *	7.2 *	0.3 *	0.2 *	0.3 *	57,700 *	24,810 *	32,660 *
	Small urban centres	5.3	4.4	6.3	1.4 *	1.2 *	1.5 *	1.5 *	0.9 *	2.2 *	28.6 *	19.5 *	35.5 *	4.1 *	2.4 *	5.9 *	0.2 *	0.1 *	0.3 *	38,280 *	11,400 *	26,770 *
	Toronto, Montréal, and Vancouver	3.9	4.3	3.4	1.0	1.2 *	0.9 *	0.1	0.7 *	–0.6 *	2.9	17.3 *	NA	0.9	6.6 *	NA	0.0	0.3 *	NA	8,720	21,010 *	NA
	Large urban centres other than Toronto, Montréal and Vancouver (reference)	3.8	3.5	4.0	Reference																	
Socioeconomic Determinants of Health																						
Income quintile – provincial	Q1 (lowest income)	5.4	5.0	6.0	1.7 *	1.8 *	1.8 *	2.3 *	2.2 *	2.6 *	42.4 *	44.5 *	43.5 *	8.9 *	10.3 *	8.2 *	0.4 *	0.4 *	0.4 *	83,100 *	49,130 *	37,090 *
	Q2	5.4	5.4	5.3	1.7 *	2.0 *	1.6 *	2.2 *	2.6 *	1.9 *	42.0 *	48.7 *	36.5 *	9.5 *	12.1 *	7.5 *	0.4 *	0.5 *	0.3 *	88,410 *	57,340 *	33,970 *
	Q3	4.4	4.6	4.3	1.4 *	1.7 *	1.3 *	1.3 *	1.8 *	0.9 *	30.0 *	39.4 *	21.1 *	5.8 *	8.0 *	3.8 *	0.3 *	0.3 *	0.2 *	53,700 *	37,820 *	17,420 *
	Q4	3.9	3.5	4.3	1.3 *	1.3	1.3 *	0.8 *	0.8	0.9 *	20.9 *	22.2	21.1 *	3.7 *	3.4	4.2 *	0.2 *	0.1	0.2 *	34,410 *	16,300	19,100 *
	Q5 (highest income) (reference)	3.1	2.8	3.4	Reference																	
Education Reference (aged 20+)	Less than high school	8.8	8.1	9.3	4.0 *	3.5 *	4.3 *	6.6 *	5.8 *	7.1 *	74.8 *	71.5 *	76.7 *	18.2 *	17.3 *	18.3 *	0.8 *	0.7 *	0.8 *	160,020 *	77,340 *	79,300 *
	High school graduate	5.0	4.8	5.2	2.3 *	2.1 *	2.4 *	2.8 *	2.5 *	3.0 *	55.9 *	52.1 *	58.3 *	10.7 *	10.4 *	10.6 *	0.5 *	0.4 *	0.5 *	93,850 *	46,240 *	46,010 *
	Some postsecondary	5.1	4.7	6.7	2.3 *	2.0 *	2.6 *	2.9 *	2.3 *	4.6 *	56.9 *	50.4 *	68.7 *	3.6 *	2.9 *	3.4 *	0.2 *	0.1 *	0.2 *	32,080 *	12,990 *	15,830 *
	Community college/Technical school/University certificate	3.9	3.7	4.2	1.9 *	1.6 *	1.9 *	1.7 *	1.4 *	2.0 *	43.7 *	37.4 *	47.9 *	14.4 *	12.0 *	16.2 *	0.6 *	0.5 *	0.7 *	126,970 *	53,380 *	70,530 *
	University graduate (reference)	2.2	2.3	2.1	Reference																	
Employment status (aged 18–75)	Permanently unable to work	9.6	10.2 E	8.8 E	2.2 *	2.5 * E	1.9	5.2 *	6.0 * E	4.1	54.0 *	59.6 * E	46.8	2.7 *	3.5 * E	2.0	0.1 *	0.2 * E	0.1	24,970 *	15,750 * E	9,150
	No job last week, looked for work in the past 4 weeks	5.9	4.4	7.0	1.3 *	1.1	1.5 *	1.5 *	0.3	2.3 *	25.5 *	7.1	33.3 *	1.2 *	0.3	1.8 *	0.1 *	0.0	0.1 *	11,240 *	1,190	8,550 *
	No job last week, did not look for work in the past 4 weeks	4.8	4.6	5.8	1.1	1.1	1.2	0.4	0.5	1.1	8.3	10.1	19.1	2.0	3.0	4.0	0.1	0.1	0.2	18,250	13,300	18,820
	Had a job last week (reference)	4.4	4.1	4.7	Reference																	
Occupation (aged 18–75)	Unskilled	6.4	5.5	7.4	2.5 *	2.4 *	2.6 *	3.8 *	3.2 *	4.6 *	59.9 *	57.5 *	61.9 *	6.0 *	5.4 *	6.5 *	0.3 *	0.2 *	0.3 *	48,140 *	20,750 *	27,440 *
	Semiskilled	5.5	5.0	6.1	2.2 *	2.1 *	2.2 *	3.0 *	2.7 *	3.3 *	53.7 *	53.3 *	54.2 *	12.7 *	13.5 *	12.0 *	0.6 *	0.6 *	0.6 *	102,210 *	51,370 *	50,290 *
	Skilled/Technical/Supervisor	4.5	4.1	4.7	1.8 *	1.8 *	1.7	1.9 *	1.8 *	1.9	42.9 *	42.9 *	40.1	11.1 *	8.2 *	12.6	0.5 *	0.3 *	0.6	88,730 *	31,430 *	52,870
	Manager	3.1	3.4 E	2.8	1.2	1.5 E	1.0	0.5	1.1 E	–0.1	16.7	31.3 E	NA	1.0	1.6 E	NA	0.0	0.1 E	NA	7,660	6,260 E	NA
	Professional (reference)	2.6	2.3	2.8 E	Reference																	

NOTE:

The purpose of the colour scaling is to map (for all indicators and stratifiers) the following: 1. the relative and absolute inequalities; 2. the patterns of inequalities (e.g. Indigenous populations frequently experience inequalities compared to non-Indigenous); 3. the gradients of inequalities (e.g. there are frequently inequalities in a gradient across income strata).

The magnitude and distribution of inequalities shown in this table should be interpreted with caution, taking into consideration one indicator at a time, the differences among the data sources used (e.g. survey or administrative registry), and existing limitations in the measurement of the social stratifiers.

Colour scaling for rate ratios below 1 and rate differences below 0 are applied using the reciprocal value and the absolute value respectively. For example, for a RR of 0.5, the colour scale applied is for the value 2.0 (1/0.5) and for a RD of -10, the colour scale for the value 10 is used. Colour scaling is only applied when the difference between the value and the reference group is statistically significant.

LEGEND

		PR	PD per 100	
Not applicable	NA	> 2.3	> 15.2	Larger Inequality
Not reportable	F	1.7 → 2.3	10.5 → 15.2	
Report with Caution	E	1.5 → 1.7	7.9 → 10.5	
Statistically Significant	*	1.4 → 1.5	5.8 → 7.9	
Reference	▨	1.3 → 1.4	4.4 → 5.8	
		1.0 → 1.3	0.0 → 4.4	Smaller Inequality

Annex 3. Absolute and Relative Inequalities, and Population Impact Measures for Lung Cancer Incidence.
Data Source: CCR 2008–2010

					SUMMARY MEASURES									POPULATION IMPACT MEASURES								
Social Stratifiers		Age-Standardized Rate per 100 000			Rate Ratio (RR)			Rate Difference (RD) per 100 000			Attributable Fraction (AF%)			Population Attributable Fraction (PAF%)			Population Attributable Rate (PAR) per 100 000			Population Impact Number (PIN)		
		Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males	Both Sexes	Females	Males
Overall	Both Sexes	68.2	59.2	80.3	NA									NA								
Population Groups																						
Sex/gender	Male	80.3	NA		NA	NA	1.4 *	NA	NA	21.1 *	NA	NA	26.3 *	NA	NA	14.0 *	NA	NA	9.8 *	NA	NA	2,277 *
	Female (reference)	59.2			Reference																	
Predominant Indigenous identity group (area-based measure)	First Nations as predominant group	115.2	102.9	132.6	1.7 *	1.7 *	1.6 *	46.2 *	43.1 *	51.3 *	40.1 *	41.9 *	38.7 *	0.4 *	0.4 *	0.4 *	0.3 *	0.2 *	0.3 *	92 *	45 *	47 *
	Inuit as predominant group	178.4	176.2	206.1	2.6 *	2.9 *	2.5 *	109.4 *	116.4 *	124.8 *	61.3 *	66.1 *	60.6 *	0.1 *	0.1 *	0.1 *	0.1 *	0.1 *	0.1 *	18 *	10 *	9 *
	Metis as predominant group	96.9	84.4	110.0	1.4 *	1.4 *	1.4 *	27.9 *	24.6 *	28.7 *	28.8 *	29.1 *	26.1 *	0.1 *	0.1 *	0.1 *	0.1 *	0.0 *	0.1 *	18 *	8 *	9 *
	Low concentration of First Nations/Inuit/Metis identity (reference)	69.0	59.8	81.3	Reference																	
Immigrant status (area-based measure)	Low foreign-born proportion	75.1	65.9	87.7	1.6 *	1.8 *	1.5 *	28.4 *	28.8 *	28.7 *	37.8 *	43.7 *	32.7 *	29.9 *	34.6 *	25.8 *	21.2 *	22.5 *	20.0 *	6,892 *	2,726 *	3,175 *
	Medium foreign-born proportion	56.7	48.6	67.4	1.2 *	1.3 *	1.1 *	10.0 *	11.5 *	8.4 *	17.6 *	23.7 *	12.5 *	2.6 *	3.5 *	1.8 *	1.8 *	2.2 *	1.4 *	591 *	375 *	221 *
	High foreign-born proportion (reference)	46.7	37.1	59.0	Reference																	
Rural/urban residence	Remote areas	85.7	73.3	101.1	1.2 *	1.2 *	1.3 *	17.0 *	12.4 *	21.4 *	19.8 *	16.9 *	21.2 *	1.5 *	1.2 *	1.7 *	1.1 *	0.8 *	1.7 *	348 *	138 *	206 *
	Provincial rural areas	76.9	66.2	89.7	1.1 *	1.1 *	1.1 *	8.2 *	5.3 *	10.0 *	10.7 *	8.0 *	11.1 *	1.6 *	1.1 *	1.8 *	1.2 *	0.7 *	1.4 *	282 *	125 *	226 *
	Small urban centres	77.2	67.8	89.9	1.1 *	1.1 *	1.1 *	8.5 *	6.9 *	10.2 *	11.0 *	10.2 *	11.3 *	1.8 *	1.7 *	1.8 *	1.3 *	1.1 *	1.4 *	415 *	180 *	226 *
	Toronto, Montreal, and Vancouver	60.5	51.6	72.9	0.9 *	0.8 *	0.9 *	-8.2 *	-9.3 *	-6.8 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Large urban centres other than Toronto, Montreal and Vancouver (reference)	68.7	60.9	79.7	Reference																	
Socioeconomic Determinants of Health																						
Income quintile (area-based measure)	Q1 (lowest income)	88.9	76.3	107.1	1.7 *	1.6 *	1.8 *	36.7 *	29.5 *	48.0 *	41.3 *	38.7 *	44.8 *	10.0 *	9.5 *	10.7 *	7.1 *	6.2 *	8.3 *	2,226 *	1,035 *	1,227 *
	Q2	76.8	65.5	92.5	1.5 *	1.4 *	1.6 *	24.6 *	18.7 *	33.4 *	32.0 *	28.6 *	36.1 *	7.3 *	6.4 *	8.3 *	5.2 *	4.2 *	6.4 *	1,697 *	700 *	1,025 *
	Q3	69.3	59.5	82.1	1.3 *	1.3 *	1.4 *	17.1 *	12.7 *	23.0 *	24.7 *	21.3 *	28.0 *	4.9 *	4.2 *	5.7 *	3.5 *	2.7 *	4.4 *	1,150 *	459 *	704 *
	Q4	61.8	53.9	72.1	1.2 *	1.2 *	1.2 *	9.6 *	7.1 *	13.0 *	15.5 *	13.2 *	18.0 *	2.8 *	2.3 *	3.2 *	2.0 *	1.5 *	2.5 *	644 *	253 *	401 *
	Q5 (highest income) (reference)	52.2	46.8	59.1	Reference																	
Education (area-based measure)	Q1 (lowest education)	84.0	70.6	101.6	1.5 *	1.4 *	1.6 *	29.3 *	20.9 *	39.7 *	34.9 *	29.6 *	39.1 *	8.6 *	7.0 *	10.1 *	6.1 *	4.5 *	7.8 *	2,015 *	757 *	1,258 *
	Q2	75.2	65.2	88.5	1.4 *	1.3 *	1.4 *	20.5 *	15.5 *	26.6 *	27.3 *	23.8 *	30.1 *	5.9 *	5.1 *	6.5 *	4.2 *	3.3 *	5.1 *	1,277 *	587 *	815 *
	Q3	68.8	59.7	81.2	1.3 *	1.2 *	1.3 *	14.1 *	10.0 *	19.3 *	20.5 *	16.8 *	23.8 *	4.0 *	3.3 *	4.7 *	2.9 *	2.1 *	3.6 *	940 *	359 *	581 *
	Q4	63.6	55.8	74.5	1.2 *	1.1 *	1.2 *	8.9 *	6.1 *	12.6 *	14.0 *	10.9 *	16.9 *	2.5 *	2.0 *	3.0 *	1.8 *	1.3 *	2.3 *	582 *	216 *	369 *
	Q5 (highest education) (reference)	54.7	49.7	61.9	Reference																	
Deprivation index—material	Q5 (most deprived)	83.7	70.5	100.3	1.6 *	1.5 *	1.7 *	31.3 *	22.0 *	41.9 *	37.4 *	31.2 *	41.8 *	8.6 *	6.9 *	10.0 *	6.0 *	4.4 *	7.6 *	1,905 *	708 *	1,181 *
	Q4	77.7	66.5	92.2	1.5 *	1.4 *	1.6 *	25.3 *	18.0 *	33.8 *	32.6 *	27.1 *	36.7 *	7.3 *	5.9 *	8.3 *	5.1 *	3.8 *	6.2 *	1,611 *	610 *	987 *
	Q3	70.7	61.3	83.2	1.3 *	1.3 *	1.4 *	18.3 *	12.8 *	24.8 *	25.9 *	20.9 *	29.8 *	5.3 *	4.3 *	6.2 *	3.7 *	2.7 *	4.7 *	1,184 *	444 *	729 *
	Q2	63.5	55.4	74.5	1.2 *	1.1 *	1.3 *	11.1 *	6.9 *	16.1 *	17.5 *	12.5 *	21.6 *	3.2 *	2.3 *	4.0 *	2.3 *	1.5 *	3.0 *	719 *	242 *	470 *
	Q1 (least deprived) (reference)	52.4	48.5	58.4	Reference																	
Deprivation index—social	Q5 (most deprived)	87.3	76.6	104.2	1.6 *	1.6 *	1.6 *	31.0 *	29.5 *	37.9 *	35.5 *	38.5 *	36.4 *	9.3 *	10.9 *	8.9 *	6.5 *	6.9 *	6.7 *	2,061 *	1,122 *	1,052 *
	Q4	73.3	63.9	86.5	1.3 *	1.4 *	1.3 *	17.0 *	16.8 *	20.2 *	23.2 *	26.3 *	23.4 *	5.1 *	5.9 *	5.0 *	3.5 *	3.8 *	3.8 *	1,126 *	608 *	594 *
	Q3	66.9	57.7	75.0	1.2 *	1.2 *	1.2 *	10.6 *	10.6 *	8.4 *	15.8 *	18.4 *	11.2 *	3.2 *	3.6 *	2.1 *	2.2 *	2.3 *	1.6 *	699 *	370 *	250 *
	Q2	63.0	53.2	74.7	1.1 *	1.1 *	1.1 *	6.7 *	6.1 *	8.4 *	10.6 *	11.5 *	11.2 *	1.9 *	1.9 *	2.1 *	1.2 *	1.2 *	1.6 *	421 *	199 *	250 *
	Q1 (least deprived) (reference)	56.3	47.1	66.3	Reference																	
Deprivation index—material & social	Q5Q5 (most deprived)	111.6	97.8	133.8	2.2 *	2.2 *	2.4 *	62.0 *	53.0 *	78.9 *	55.6 *	54.2 *	59.0 *	3.5 *	2.7 *	3.6 *	2.5 *	2.2 *	2.7 *	784 *	377 *	422 *
	Q1Q1 (least deprived) (reference)	49.6	44.8	54.9	Reference																	

NOTE:

The purpose of the colour scaling is to map (for all indicators and stratifiers) 1- the relative and absolute inequalities, 2- the patterns of inequalities (e.g. Indigenous populations frequently experience inequalities compared to non-Indigenous), 3- the gradients of inequalities (e.g. there are frequently inequalities in a gradient across income deciles). The magnitude and distribution of inequalities shown in this table should be interpreted with caution, taking into consideration one indicator at a time, the differences among the data sources used (e.g. surveys vs. administrative registers), and existing limitations in the measurement of the social stratifiers.

Colour scaling for rate ratios below 1 and rate differences below 0 was applied using the reciprocal value and the absolute value respectively. For example, for a RR of 0.5, the colour scale applied is for the value 2.0 (1/0.5) and for a RD of -10, the colour scale for the value 10 is used. Colour scaling is only applied when the difference between the value and the reference group is statistically significant.

LEGEND

		RR	RD per 100 000
Non-applicable	NA	> 1.8	> 250
Non-reportable	F	1.5 → 1.8	150 → 250
Report with Caution	E	1.3 → 1.5	120 → 150
Statistically Significant	*	1.2 → 1.3	80 → 120
Reference	▨	1.1 → 1.2	50 → 80
		1.0 → 1.1	0 → 50

Larger inequality

Smaller inequality

References

(1) Rehm J, Baliunas D, Brochu S, Fischer B, Gnam W, Patra J, et al. The costs of substance abuse in Canada 2002. Ottawa: Canadian Centre on Substance Abuse. 2006:1-14.

(2) World Health Organization. Global Health Risks: Mortality and burden of disease attributable to selected major risks. Geneva: WHO; 2009 .

(3) Canadian Cancer Society. [Internet]. Smoking and cancer [updated 2017 cited 23 November, 2017]; [about 6 screens]. Available from: http://www.cancer.ca/en/prevention-and-screening/live-well/smoking-and-tobacco/smoking-and-cancer/?region=on.

(4) Krueger H, Krueger J, Koot J. Variation across Canada in the economic burden attributable to excess weight, tobacco smoking and physical inactivity. Canadian Journal of Public Health. 2015;106(4):e177-e177.

(5) Centers for Disease Control and Prevention (CDC). [Internet]. Atlanta: Vital Signs: Disparities in Nonsmokers' Exposure to Secondhand Smoke — United States, 1999–2012 [updated 2015 6 February, 2015; cited 23 November, 2017]; [about 13 screens]. Available from: http://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2014_SHS_Table_A-12.pdf.

(6) Garrett BE, Dube SR, Babb S, McAfee T. Addressing the social determinants of health to reduce tobacco-related disparities. Nicotine Tobacco Res. 2014;17(8):892-7.

(7) Reading C, Loppie S, Wien F. Health inequalities and the social determinants of Aboriginal peoples' health. : National Collaborating Centre for Aboriginal Health Prince George, BC; 2009.

(8) Collishaw N. History of tobacco control in Canada. Ottawa: Physicians for a Smoke-Free Canada; 2009 [cited 23 November, 2017].

(9) Eriksen M, Whitney C. Risk Factors: Tobacco. Global Handbook on Noncommunicable Diseases and Health Promotion: Springer; 2013. p. 115-136.

(10) Lopez AD, Collishaw NE, Piha T. A descriptive model of the cigarette epidemic in developed countries. Tob Control. 1994;3(3):242.

(11) Hiscock R, Bauld L, Amos A, Fidler JA, Munafò M. Socioeconomic status and smoking: a review. Ann N Y Acad Sci. 2012;1248(1):107-23.

(12) Corsi DJ, Lear SA, Chow CK, Subramanian S, Boyle MH, Teo KK. Socioeconomic and geographic patterning of smoking behaviour in Canada: a cross-sectional multilevel analysis. PLoS One. 2013;8(2):e57646.

(13) Asbridge M, Ralph K, Stewart S. Private space second-hand smoke exposure and the mental health of non-smokers: A cross-sectional analysis of Canadian adults. Addict Behav. 2013;38(3):1679-86.

(14) Vozoris N, Lougheed MD. Second-hand smoke exposure in Canada: Prevalence, risk factors, and association with respiratory and cardiovascular diseases. Canadian Respiratory Journal. 2008;15(5):263-9.

(15) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(16) Curado M, Edwards B, Shin H, et al. Cancer Incidence in Five Continents. Lyon, France: nternational Agency for Research on Cancer (IARC); 2007 [cited 23 November, 2017].

(17) Mao Y, Hu J, Ugnat A, Semenciw R, Fincham S. Socioeconomic status and lung cancer risk in Canada. Int J Epidemiol. 2001;30(4):809-17.

(18) Sidorchuk A, Agardh EE, Aremu O, Hallqvist J, Allebeck P, Moradi T. Socioeconomic differences in lung cancer incidence: a systematic review and meta-analysis. Cancer Causes & Control. 2009;20(4):459.

(19) Mitra D, Shaw A, Tjepkema M, Peters P. Social determinants of lung cancer incidence in Canada: A 13-year prospective study. Health Rep. 2015 Jun 17;26(6):12-20.

(20) Carrière GM, Tjepkema M, Pennock J, Goedhuis N. Cancer patterns in Inuit Nunangat: 1998-2007. Int J Circumpolar Health. 2012;71(1):18581-8.

(21) Marrett LD, Chaudhry M. Cancer incidence and mortality in Ontario First Nations, 1968-1991 (Canada). Cancer Causes & Control. 2003 Apr 2003;14(3):259-68.

(22) Canadian Partnership Against Cancer. Examining Disparities in Cancer Control: A System Performance Special Focus Report. 2014.

(23) Reid J, Hammond P, Driezen P. Socio-economic status and smoking in Canada, 1999-2006: Has there been any progresson disparities in tobacco use? Can J Public Health. 2010;101(1).

(24) Pampalon R, Hamel D, Gamache P. A comparison of individual and area-based socio-economic data for monitoring social inequalities in health. Health Reports. 2009;20(4):85.

(25) Chen J, Ng E, Wilkins R. The health of Canada's immigrants in 1994-95. Health Reports-Statistics Canada. 1996;7:33-46.

(26) Statistics Canada. [Internet]. Table 105-0503: Health indicator profile, age-standardized rate, annual estimates, by sex, Canada, provinces and territories [updated 2015 2015-06-16; Available from: http://www5.statcan.gc.ca/cansim/a26?lang=eng&id=1050503.

(27) Evans GW, Kantrowitz E. Socioeconomic status and health: the potential role of environmental risk exposure. Annu Rev Public Health. 2002;23(1):303-31.

(28) Kogevinas M, Pearce N, Susser M, Boffetta P editors. Social Inequalites and Cancer. Lyon, France: International Agency for Research on Cancer; 1997.

(29) Nagelhout GE, de Korte-de Boer D, Kunst AE, van der Meer, Regina M, de Vries H, van Gelder BM, et al. Trends in socioeconomic inequalities in smoking prevalence, consumption, initiation, and cessation between 2001 and 2008 in the Netherlands. Findings from a national population survey. BMC Public Health. 2012;12(1):303.

(30) Centers for Disease Control and Prevention (CDC). [Internet]. Summary Health Statistics: National Health Interview Survey, 2014 Available from: http://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2014_SHS_Table_A-12.pdf.

(31) Australian Institute of Health and Welfare. National Drug Strategy Household Survey detailed report 2013. 2014 .

(32) New Zealand Ministry of Health. Annual Update of Key Results 2014/15: New Zealand Health Survey [Internet]. Wellington: New Zealand Ministry of Health; 2015 [cited 2017 Feb 20]. Available from: http://www.health.govt.nz/publication/annual-update-key-results-2014-15-new-zealand-health-survey.

(33) Health & Social Care Information Centre. Statistics on Smoking: England 2014. 2014 .

(34) Margerison-Zilko C, Cubbin C. Socioeconomic Disparities in Tobacco-Related Health Outcomes Across Racial/Ethnic Groups in the United States: National Health Interview Survey 2010. Nicotine & Tobacco Research. 2013;15(6):1161.

(35) Bonevski B, Paul C, Jones A, Bisquera A, Regan T. Smoky homes: Gender, socioeconomic and housing disparities in second hand tobacco smoke (SHS) exposure in a large population-based Australian cohort. Prev Med. 2014 3;60:95-101.

(36) Bougie E, Kohen D. Smoking prevalence among Inuit in Canada. Health Reports. 2017;28(2):10-4.

(37) Cancer Care Ontario. Aboriginal Cancer Strategy II. Cancer Care Ontario; 2013 [cited 23 November, 2017].

(38) Orisatoki R. The public health implications of the use and misuse of tobacco among the Aboriginals in Canada. Global journal of health science. 2013;5(1):28-34.

(39) National Collaborating Centre for Aboriginal Health. [Internet]. Prince George: National Collaborating Centre for Aboriginal Health; Tobacco Fact Sheet [updated 2013 cited 23 November, 2017]; .

(40) Arthur P, Gonzalez E, Lam Y, Rice J, Rodriguez-Garavito C, Yashar D. Strengthening indigenous rights through truth commissions: A practitioner's resource. 2012:7 December 2017.

(41) Reading J. The tobacco report, Chapter 4. In First Nations and Inuit Regional Health Survey Regina, SK; 1999.

(42) Reading J. A life course approach to the social determinants of health for Aboriginal peoples. Ottawa (ON): Senate Sub-Committee on Population Health. 2009.

(43) Jetty R, Banerji A, Berry M, Fraser-Roberts L, Goldade R, Irvine J, et al. Tobacco use and misuse among Indigenous children and youth in Canada. Paediatrics & Child Health. 2017;22(7):395-9.

(44) Young TK, Kelly JJ, Friborg J, Soininen L, Wong KO. Cancer among circumpolar populations: an emerging public health concern. Int J Circumpolar Health. 2016;75(1):29787-12.

(45) Gillespie J, Milne K, Wilson N. Secondhand smoke in New Zealand homes and cars: Exposure, attitudes, and behaviours in 2004. N Z Med J. 2005;118(1227):U1782.

HEALTH DETERMINANTS – DAILY LIVING CONDITIONS

PHYSICAL AND SOCIAL ENVIRONMENT

INEQUALITIES IN
CORE HOUSING NEED IN CANADA

INEQUALITIES HIGHLIGHTS

- Some Canadian households are in core housing need. This means that the housing is too expensive (costs more than 30% of total pre-tax household income), is overcrowded (e.g. does not have enough bedrooms), and/or is inadequate (e.g. requires major repairs).
- The proportion of Canadians in the lowest income group who live in households in core housing need is 7.4 times greater than the proportion in the highest income group who live in households in core housing need. This corresponds to 64.4 more people per 100 living in households in core housing need.
- The prevalence of core housing need among recent immigrants is 2.0 times this prevalence among Canadian-born people. This means that there are 28.9 more people per 100 living in households in core housing need. The percentage of visible minority Canadians in core housing need is 1.8 times the percentage of non–visible minority Canadians. This represents 22.2 more people per 100 living in households in core housing need.
- Core housing need among adults who are unemployed but looking for work is 1.6 times that of employed adults. This equates to 14.1 more persons per 100 living in households in core housing need.

ACRONYM	FULL NAME
CI	Confidence Interval
NHS	National Household Survey

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Housing is a key social determinant of health (1). Poor housing conditions, including issues such as mould, overcrowding, and lack of affordability, have been associated with a wide range of health conditions, such as respiratory and other infectious diseases, chronic diseases (e.g. asthma), injuries, inadequate nutrition, adverse childhood development, and poor mental health outcomes (2).

One way to measure the conditions of housing is through the concept of "core housing need." According to the Canadian Housing and Mortgage Corporation, a household is in core housing need if it does not meet one or more of three standards of acceptability: adequacy (the housing requires no major repairs); suitability (the housing has enough bedrooms for the size and composition of the people living in the household); and affordability (the housing costs less than 30% of total pre-tax household income) (3). A household is also in core housing need if it would have to spend 30% or more of its before-tax income to access acceptable local housing.

In 2011, as many as 1.6 million Canadian households (12.5%) were in core housing need (3). Although the percentage of households in core housing need has decreased from 13.6% in 1991 to 12.5% in 2011, population growth during this 20-year period has meant that the total number of households in core housing need increased by more than 280 000 (4). Affordability is by far the most common reason for Canadian households to be in core housing need: between 2001 and 2011, housing that was not affordable was much more common (11.2–12.3%) than housing that was overcrowded (1.7–2.0%) or in need of repair (1.9–2.1%) (3).

Housing—as assessed through core housing need—was selected as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter.)

METHODS

Data on core housing need were obtained from the 2011 cycle of the National Household Survey (NHS), a self-administered survey conducted by Statistics Canada. The data the NHS gathers, which complement data provided by the Census of Population, were collected on a voluntary basis to provide information about the demographic, social, and economic characteristics of Canadians and their households (5).

Responses for all individuals living in the same dwelling were collected from NHS participants 15 years and older. Results are reported in terms of individuals living in households in core housing need. A household was considered to be in core housing need if a) its housing fell below one or more of the suitability, affordability, and adequacy standards; and b) it would need to spend 30% or more of its pre-tax income to pay the median rent of alternative acceptable local housing.

The sample excluded household heads aged 15 to 29 years who were attending school on a full-time basis. Prevalence was standardized using the direct method, which involves weighting age-specific prevalence by 5-year age groups according to the age distribution of the 2011 Canadian Census of Population.

Inequalities in rates of core housing need were assessed by measuring differences in core housing need according to social stratifiers grouped under socioeconomic and sociodemographic stratifiers. Sociodemographic stratifiers include sex/gender, Indigenous identity, visible minority status[46], immigrant status, and rural/urban residence. Socioeconomic stratifiers include income, education (ages 20+ years), and employment status (ages 18–75 years). Sex/gender-specific inequalities for all the social stratifiers were also calculated but reported only if the differences between males and females were statistically significant.

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[46] Visible minority status was assessed only among non-Indigenous people. Based on the *Employment Equity Act*, the National Household Survey defines visible minorities as people who are "non-Caucasian in race or non-white in colour" who are not Indigenous (16).

For the Indigenous identity stratifier, the NHS sampling frame captures information on core housing need for Indigenous people who identify as Inuit, Métis, and First Nations living off reserve. (Housing costs for most First Nations people living on reserve are paid through band housing arrangements. As the NHS does not collect information on shelter costs, the affordability component of core housing need for these households cannot be determined.)

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported along with their 95% confidence intervals (CIs). Statistical significance was assessed using 95% confidence intervals (6). Sex/gender-specific inequalities for all of the social stratifiers were also calculated but reported only if the differences were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable fraction, population attributable risk, and population impact number.

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in the Canadian context. (For more information, see the Methodology chapter.)

FINDINGS

In 2011, one-third (33.1%; 95% CI: 32.8–33.4) of Canadians lived in households that were in core housing need (Annex 1). Statistically significant inequalities were observed for most social stratifiers. (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Sex/Gender

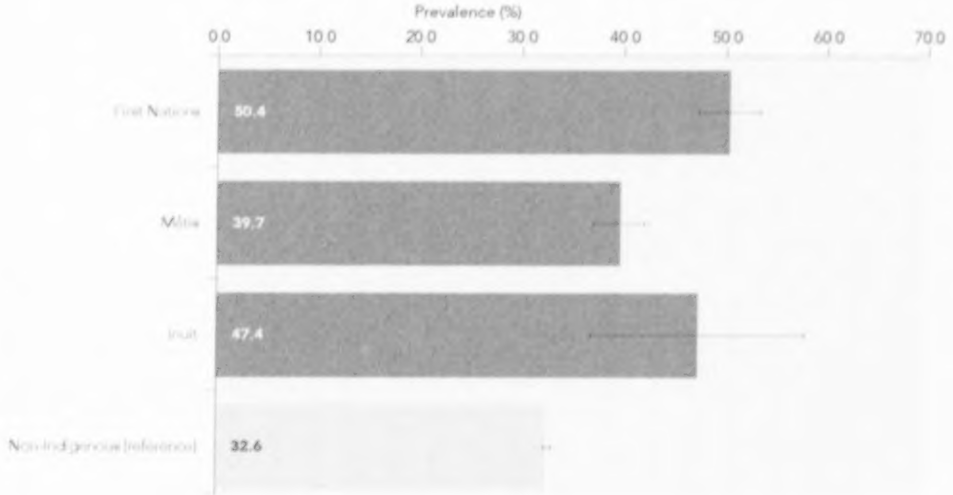
There was a modest difference in prevalence of core housing need between men and women. Among women aged 15 to 75 years, this prevalence was 1.1 (95% CI: 1.1–1.1) times that among men in the same age range.

Indigenous Peoples

The prevalence of core housing need among Indigenous peoples in Canada was higher than among non-Indigenous people. First Nations people living off reserve had prevalence of core housing need 1.5 (95% CI: 1.5–1.6) times that of non-Indigenous people. Among Inuit, this prevalence ratio was also 1.5 (95% CI: 1.1–1.8); among Métis, it was 1.2 (95% CI: 1.1–1.3) (Figure 1).

FIGURE 1

Individuals in Core Housing Need by Indigenous Identity, Canada†, ages 15+ years, 2011



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
First Nations	1.5*	17.8*	35.3*	1.2*	0.4*	111 744*
Métis	1.2*	7.1*	17.8*	0.3*	0.1*	25 903*
Inuit	1.5*	14.8*	31.2	0.1^{E}	0.0^{E}	5 044^{E}
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0

† Excluding First Nations living on reserve and full-time students aged 15–29
* Significantly different from reference population
Age standardization was performed using the 2011 Census of Population.
Source: National Household Survey (2011)

Visible Minority Status

The prevalence of core housing need among Canadians who were visible minorities was 1.8 (95% CI: 1.7–1.8) times the prevalence among Canadians who were not visible minorities (Figure 2).

If the prevalence of core housing need among visible minorities was equal to that of non-visible minorities, there would be a 43.8% (95% CI: 42.7–44.8) reduction in core housing need among visible minority Canadians and a 12.4% (95% CI: 12.0–12.9%) reduction in the overall national prevalence. This would correspond with 1 165 477 (95% CI: 1 117 890–1 213 065) fewer people living in core housing need.

> If the prevalence of core housing need among visible minorities and non-visible minorities was the same, core housing need would be reduced by 43.8% among visible minorities.

Immigrant Status

Both recent immigrants (≤10 years) and long-term immigrants (>10 years) had a higher prevalence of core housing need than non-immigrants. Recent immigrants had prevalence of core housing need 2.0 (95% CI: 1.9–2.0) times the prevalence of non-immigrants, whereas long-term immigrants had prevalence of core housing need 1.2 (95% CI: 1.2–1.3) times that of non-immigrants. This means that there were 28.9 (CI: 27.8–30.1) per 100 more recent immigrants in core housing need and 7.2 (95% CI: 6.0–8.4) per 100 more long-term immigrants in core housing need compared with non-immigrants (Figure 3).

If prevalence of core housing need among recent immigrants was the same as the prevalence among non-immigrants, there would be a 5.3% (95% CI: 5.0–5.6%) reduction in the overall national prevalence. If long-term immigrants had the same prevalence of core housing need as non-immigrants, there would be a 3.3% (95% CI: 2.8–3.8%) reduction in the overall national prevalence.

Further disaggregating results for immigrant groups by visible minority status reveals additional inequalities in core housing need. The prevalence of core housing need among recent immigrants who are visible minorities was 2.2 (95% CI: 2.2–2.3) times the prevalence among non-immigrant, non-visible minorities. For recent immigrants who are non-visible minorities, this prevalence was 1.7 (95% CI: 1.6–1.8) times the prevalence of non-immigrant, non-visible minorities. Moreover, while the prevalence of core housing need was lower among long-term immigrants than among recent immigrants, it remained higher for visible minority long-term immigrants than for non–visible minority long-term immigrants (Figure 4).

Income

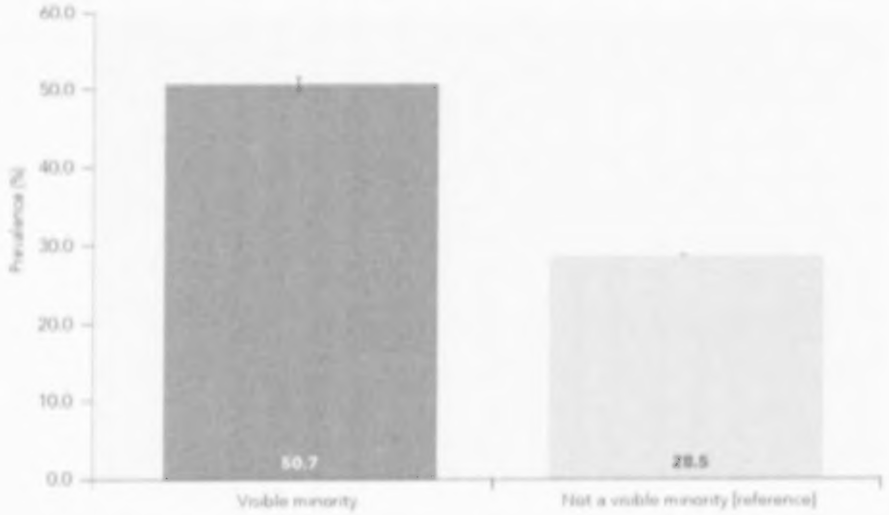
As affordability is a key criterion of housing acceptability, it is not surprising that the prevalence of core housing need increased as income declined. Canadians living in the lowest income quintile had a prevalence of core housing need 7.4 (95% CI: 7.1–7.7) times the prevalence of Canadians living in the highest income quintile. The prevalence of core housing need among Canadians in the second, third, and fourth lowest income quintiles was, respectively, 4.2 (95% CI: 4.0–4.4) times, 2.5 (95% CI: 2.3–2.6) times, and 1.6 (95% CI: 1.5–1.6) times that of Canadians in the highest income quintile (Figure 5).

Education (20+ years)

As with income, the prevalence of core housing need was inversely related to level of education. The prevalence of core housing need among Canadians aged 20 years and older with less than high school education was 1.4 (95% CI: 1.3–1.5) times the prevalence among university graduates (Figure 6).

FIGURE 2

Individuals in Core Housing Need by Visible Minority Status, Canada†, ages 15+ years, 2011

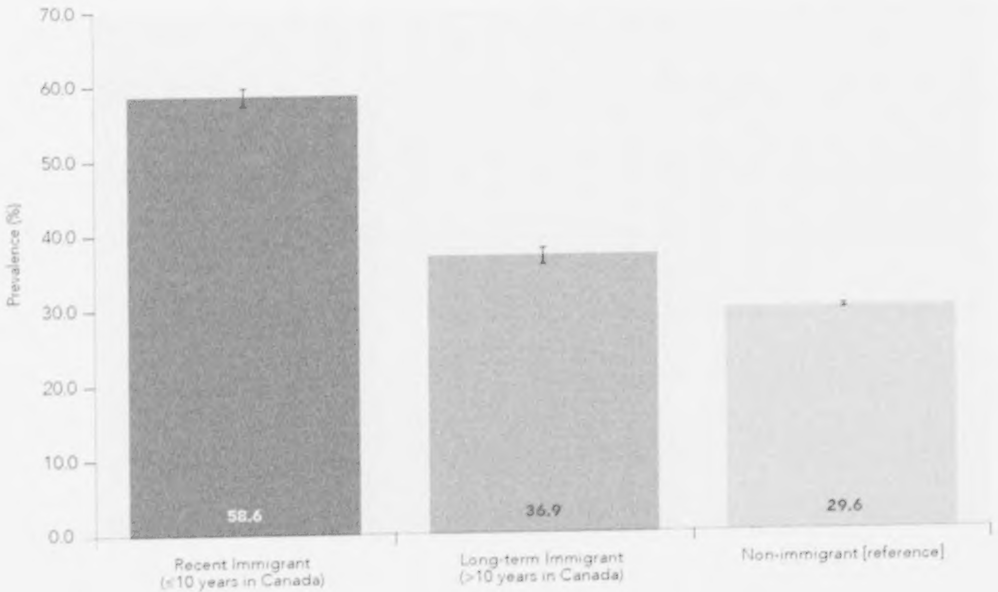


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Visible minority	1.8*	22.2*	43.8*	12.4*	4.1*	1,165,471*
Not a visible minority [reference]	1.0	0.0	0.0	0.0	0.0	0

† Excluding full time students aged 15-29
* Significantly different from reference population
Age standardization was performed using the 2011 Census of Population.
Source: National Household Survey (2011)

FIGURE 3

Individuals in Core Housing Need by Immigrant Status, Canada†, ages 15+ years, 2011

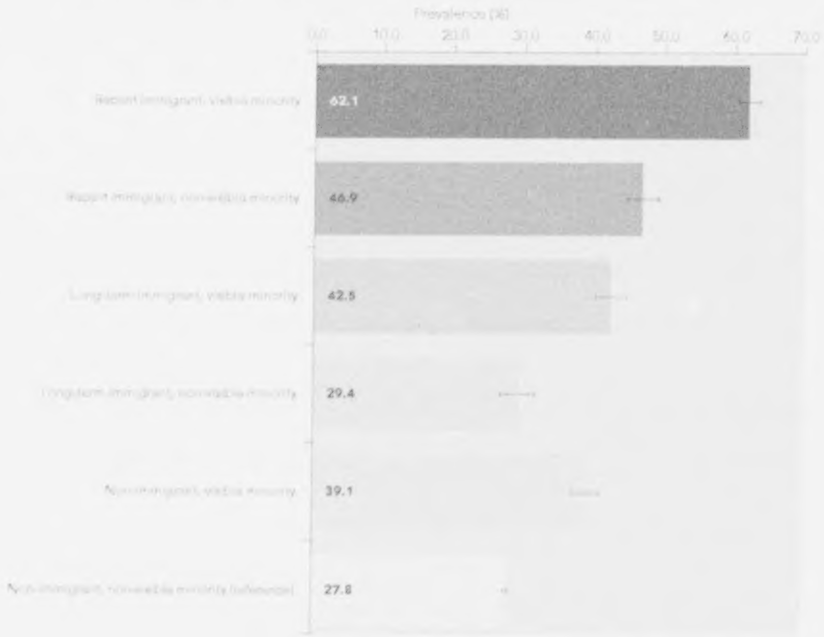


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (RD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Recent immigrant (≤10 years in Canada)	2.0*	28.9*	49.4*	5.3*	1.7*	497 242*
Long-term (>10 years in Canada)	1.2*	7.2*	19.6*	3.3*	1.1*	306 627*
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0

† Excluding full-time students aged 15–29
* Significantly different from reference population
Age standardization was performed using the 2011 Census of Population.
Source: National Household Survey (2011)

FIGURE 4

Individuals in Core Housing Need by Immigrant Status and Visible Minority Status, in Canada†, 2011

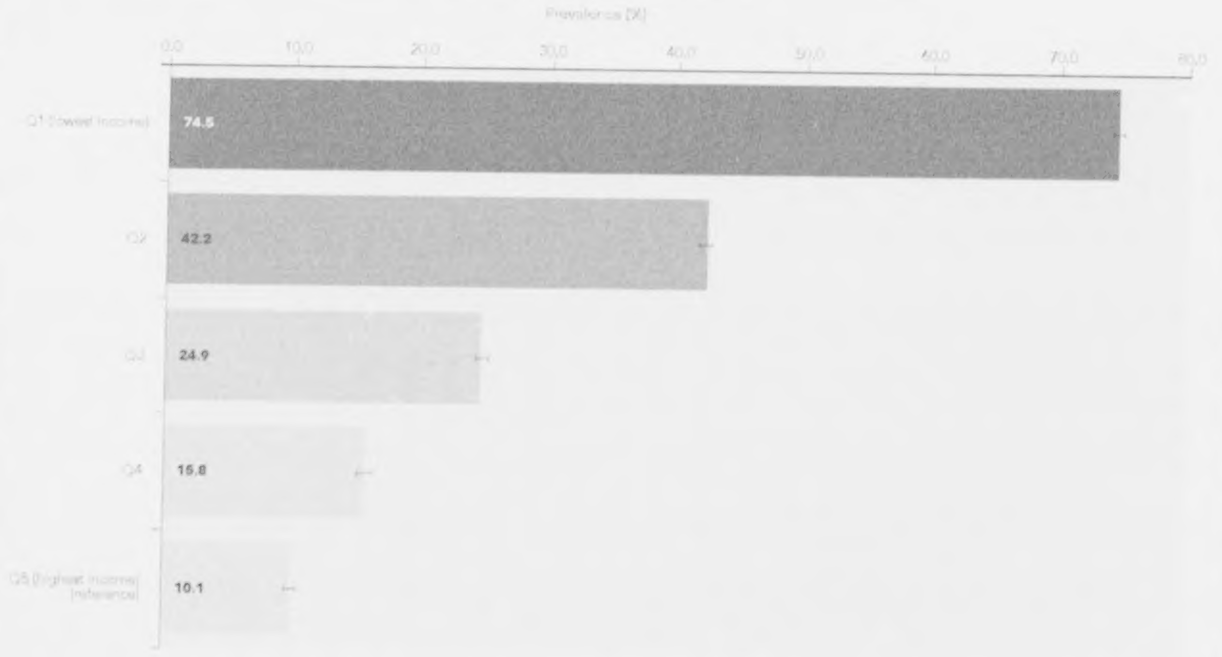


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Recent immigrant, visible minority	2.2*	34.3*	55.2*	4.8*	1.6*	447 260*
Recent immigrant, non-visible minority	1.7*	19.1*	40.7*	0.8*	0.3*	74 239*
Long-term immigrant, visible minority	1.5*	14.7*	34.5*	3.6*	1.2*	334 794*
Long-term immigrant, non-visible minority	1.1	1.5	5.2	0.3	0.1	29 881
Non-immigrant, visible minority	1.4*	11.3*	28.8*	2.2*	0.7*	208 449*
Non-immigrant, non-visible minority [reference]	1.0	0.0	0.0	0.0	0.0	0

† Excluding full-time students aged 15–29
* Significantly different from reference population
Age standardization was performed using the 2011 Census of Population.
Source: National Household Survey (2011)

FIGURE 5

Individuals in Core Housing Need by Income Quintile, ages 15+ years, Canada†, 2011

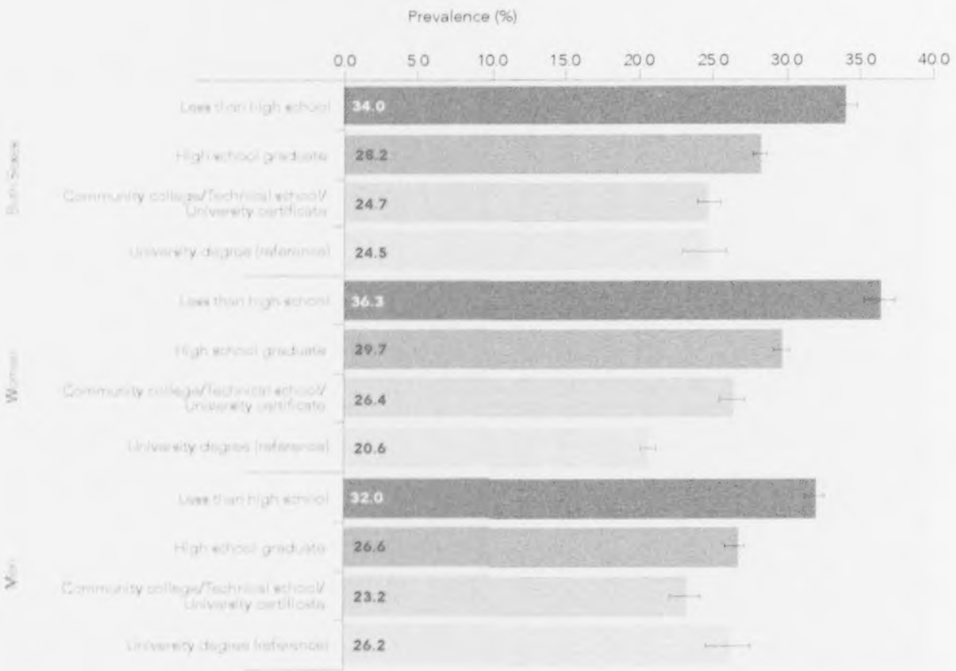


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Q1 (lowest income)	7.4*	64.4*	86.4*	37.1*	12.2*	3 475 261*
Q2	4.2*	32.1*	76.0*	19.6*	6.4*	1 840 140*
Q3	2.5*	14.8*	59.4*	9.1*	3.0*	853 410*
Q4	1.6*	5.7*	36.1*	3.5*	1.2*	332 048*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
† Excluding full-time students aged 15–29
* Significantly different from reference population
Age standardization was performed using the 2011 Census of Population.
Source: National Household Survey (2011)

FIGURE 6

Individuals in Core Housing Need by Education Level and Sex/Gender, Canada†, ages 20+ years, 2011



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Less than high school	1.4*	9.6*	28.1*	4.6*	1.5*	427 301*
High school graduate	1.2*	3.7*	13.1*	2.5*	0.8*	237 803*
Community college/Technical school/University certificate	1.0	0.3	1.2	0.3	0.1	27 582
University degree [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Less than high school	1.8*	15.7*	43.2*	7.1*	2.4*	348 611*
High school graduate	1.4*	9.1*	30.6*	6.1*	2.1*	297 889*
Community college/Technical school/University certificate	1.3*	5.7*	21.7*	5.5*	1.9*	270 294*
University degree [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Less than high school	1.2*	5.8*	18.1*	2.9*	0.9*	129 179*
High school graduate	1.0	0.5	1.8	0.3	0.1	14 752
Community college/Technical school/University certificate	0.9*	−3.0*	NA	NA	NA	NA
University degree [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
* Significantly different from reference population
Age standardization was performed using the 2011 Census of Population.
Source: National Household Survey (2011)

If the prevalence of core housing need among those with less than a high school education was equal to that of university graduates, there would be a 28.1% (95% CI: 24.0–32.3%) reduction in core housing need among Canadian adults with less than a high school education. This would result in a 4.6% (95% CI: 3.8–5.3%) reduction in the national prevalence of core housing need and 427 301 (95% CI: 357 195–497 407) fewer Canadian adults in core housing need.

Sex/gender differences in core housing need by education were observed, although the direction of difference varied by specific level of educational attainment. With the exception of university graduates, the prevalence of core housing need was higher among women than among men. Among those with a university degree, the pattern is reversed, with prevalence of core housing need higher among men.

Employment Status

Unemployed Canadian adults had a higher prevalence of core housing need than employed Canadian adults. Those who had no job last week and had looked for work had prevalence of core housing need 1.6 (95% CI: 1.5–1.7) times that of employed Canadian adults. At 1.4 (95% CI: 1.2–1.5) times the prevalence among employed Canadian adults, the difference was slightly less among those who had no job last week and did not look for work (Figure 7).

If the prevalence of core housing need among Canadian adults who had no job last week and had looked for work was equal to that of employed Canadian adults, there would be a 37.6% (95% CI: 33.7–41.6%) reduction in core housing need among unemployed Canadian adults who were looking for work. This would equate to 147 020 (95% CI: 128 311–165 729) fewer Canadian adults living in core housing need.

Women who reported that they had no job last week and did not look for work had a particularly high prevalence of core housing need compared with men in the same employment situation (35.7% versus 26.7%).

Rural/Urban Residence

Core housing need varied by rural/urban residence[47]. People living in Canada's largest cities (Montréal, Toronto, and Vancouver) had a core housing need 1.3 (95% CI: 1.3–1.4) times that of people living in small urban centres and provincial rural and remote areas. This prevalence ratio was slightly higher than that of people living in other large cities, among whom prevalence was 0.9 times that of those living in other parts of the country (Figure 8).

If the prevalence of core housing need was the same for these groups, there would be a 23.3% (95% CI: 20.1–26.5%) reduction in core housing need in Canada's three largest cities and a 10.0% (95% CI: 8.6–11.4%) reduction in the rate of core housing need in the overall Canadian population. This would result in 935 673 (95% CI: 803 637–1 067 709) fewer people living in core housing need in Canada.

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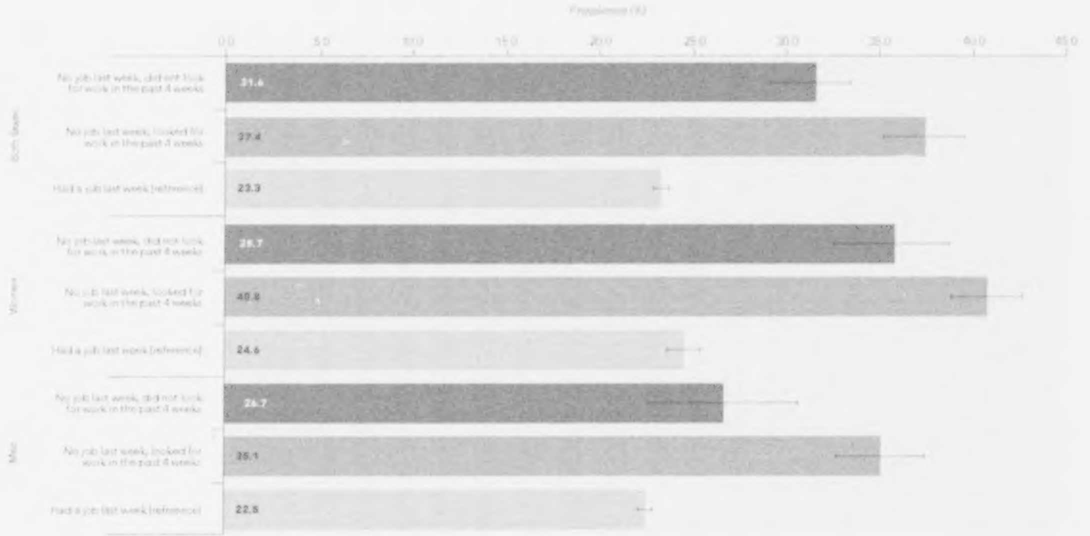
[47] For definitions of rural/urban subgroups, see the Methodology chapter.

FIGURE 7

Individuals in Core Housing Need by Employment Status and Sex/Gender, Canada†, ages 18–75 years, 2011

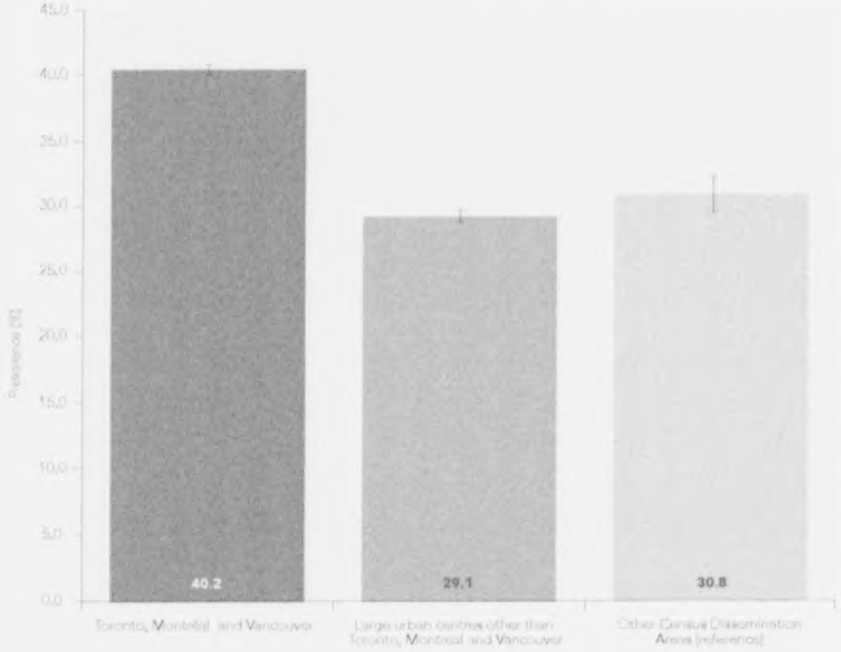


BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
No job last week, did not look for work in the past 4 weeks	1.4*	8.3*	26.2*	0.2*	0.1*	21 212*
No job last week, looked for work in the past 4 weeks	1.6*	14.1*	37.6*	1.6*	0.5*	147 020*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
No job last week, did not look for work in the past 4 weeks	1.5*	11.1*	31.2*	0.3*	0.1*	14 477*
No job last week, looked for work in the past 4 weeks	1.7*	16.2*	39.8*	1.5*	0.5*	71 886*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
No job last week, did not look for work in the past 4 weeks	1.2	4.1	15.5	0.1	0.0	5 352
No job last week, looked for work in the past 4 weeks	1.6*	12.6*	35.9*	1.7*	0.5*	75 323*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0

† Excluding full-time students aged 15–29
* Significantly different from reference population
Age standardization was performed using the 2011 Census of Population.
Source: National Household Survey (2011)

FIGURE 8

Individuals in Core Housing Need by Rural/Urban Residence, Canada†, ages 15+ years, 2011



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Toronto, Montréal and Vancouver	1.3*	9.4*	23.3*	10.0*	3.3*	935 673*
Large urban centres other than Toronto, Montréal and Vancouver	0.9*	−1.7*	NA	NA	NA	NA
Other Census Dissemination Areas [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
† Excluding full-time students aged 15–29.
* Significantly different from reference population
Age standardization was performed using the 2011 Census of Population.
Source: National Household Survey (2011)

DATA GAPS/LIMITATIONS

Many Canadian households included in the NHS cannot be assessed for core housing need. These include households that reported having shelter costs that exceed their income or reported incomes of zero or less, both of which are considered uninterpretable responses. In addition, if a household head is between 15 and 29 years old and attending school full-time, the household is not considered in core housing need even if the dwelling fails any of the standards. This is based on the assumption that unsuitable housing for full-time students is a temporary hardship during a transitional life stage (4).

Those living in band housing, including most on-reserve First Nations households, are excluded because housing costs are paid through band housing arrangements. Without discrete data on shelter costs, these households cannot be assessed for the affordability component of core housing need. For similar reasons, farm households are also excluded, as the carrying costs for farm residences are not always separable from expenses related to other farm structures (7).

The data on core housing need exclude homeless individuals—the most disadvantaged population from the perspective of housing.

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (6), calculating *p*-values would confirm statistically significant differences.

The data presented are cross-sectional in nature and intended to capture the differences between socially stratified groups in terms of the depth and impact of inequalities in core housing need at a given point in time. As the measures used to quantify the inequalities that social groups experience are defined in an aggregate grouping, the results do not capture the heterogeneous nature of some groups (e.g. immigrants). Thus, the rates among some groups may be over- or underestimated due to these broad groupings (8). The use of a combined cultural and racial background grouping can also lead to over- or underestimation of rates due to grouping heterogeneous groups under a single social categorization (9).

DISCUSSION

People living in households in core housing need face disadvantages across a range of health, social, and economic dimensions. Yet, the findings presented above indicate that pronounced inequalities in core housing need persist among different population groups in Canada.

There is a clear inverse relationship between core housing need by income and education; the prevalence of core housing need increases with decreasing income and education levels. Our findings are consistent with other research where economic insecurity is found to be the primary reason for why many Canadians experience housing need. Other research also finds that female-led lone-parent households are more likely to be in core housing need than other household types (10).

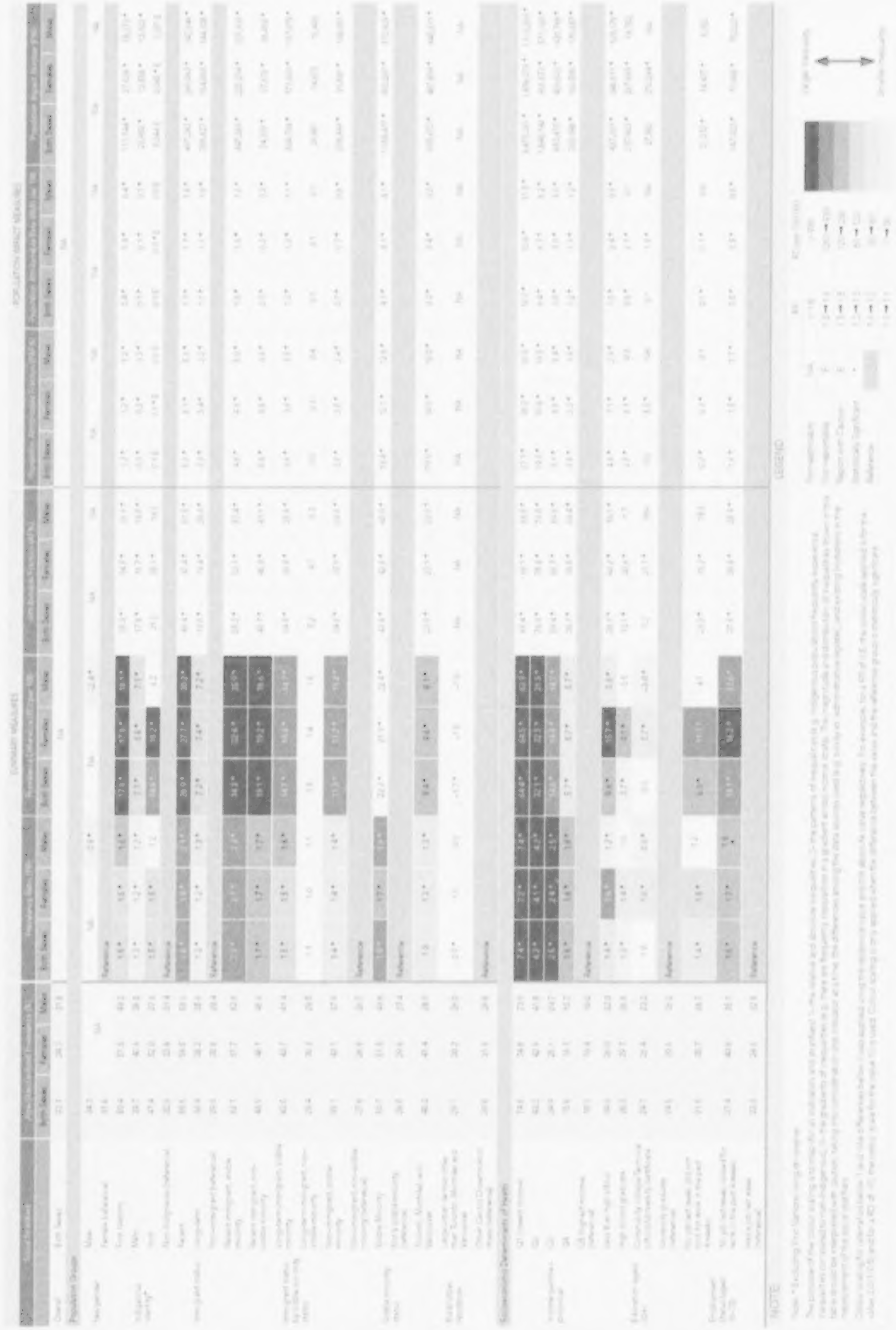
Immigrants, especially those who identify as visible minorities, are also disproportionately represented among those living in households in core housing need. While housing conditions appear to improve with length of time since immigrating, long-term immigrants who are visible minorities continue to experience a higher prevalence of core housing need than non-immigrant, non-visible minorities.

Core housing need is also high for First Nations and Inuit households. Unlike most households in core housing need in Canada, most Inuit households in core housing need fall below the adequacy or suitability standards rather than the affordability standard. In addition to housing shortages, Inuit face numerous housing challenges associated with building, maintaining, repairing, and heating their homes in the Arctic climate. Melting of permafrost can disrupt foundations, cause structural damage, and destabilize buildings. Obstacles to carrying out major housing repairs in remote locations contribute to the relatively high incidence of core housing need among Inuit households (11).

Other research also documents the inadequate housing conditions of First Nations people living on reserve. These conditions include overcrowding, a lack of clean water, and problems with mould and other contaminants (12). Although the affordability dimension of housing—and thus core housing need—among First Nations people living on reserve cannot be determined through NHS data, the adequacy and suitability of on-reserve housing can be examined. In 2011, of all on-reserve households, 28.9% were below the adequacy standard, 10.4% below the suitability standard, and 10.5% below both (10).

Failure to meet core housing need can result in greater exposure to physical and environmental toxins and allergens (13), while also negatively impacting self-reported health and mental health (14), and increasing the risk of acquiring certain infectious and chronic diseases, especially among children (2,14,15). When looking at the inadequacy, unaffordability, and unsuitability of housing, a general socioeconomic gradient emerges, where rates of core housing need increase as incomes and education levels decrease. These inequalities are also evident across a range of other social stratifications, including immigrant status, ethnicity, and Indigenous identity. Policy interventions that affect the broader environment, including socioeconomic status, neighbourhood characteristics, housing conditions, and the availability of adequate, affordable rental properties, are required (2). In order to support these policies, research and action on the upstream drivers of health inequalities related to core housing need will help to better understand the associated social, economic, and physical environments, their contribution to personal and social well-being, as well as the impact on determinants of health, including employment and community connectedness. Continued monitoring and measuring of the unequal distribution of core housing need across sociodemographic and socioeconomic groups in Canada will provide vital information that can inform programs, policies, and research, now and in the future.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Core Housing Need.
Data Source: NHS 2011



References

(1) Commission on Social Determinants of Health. Closing the gap in a generation: Health equity through action on the social determinants of health. Final report of the Commission on Social Determinants of Health.[Internet]. Geneva: World Health Organization; 2008 [cited 2017 Mar 31]. Available from: http://apps.who.int/iris/bitstream/10665/43943/1/9789241563703_eng.pdf.

(2) Krieger J, Higgins DL. Housing and health: time again for public health action. Am J Public Health. 2002 May;92(5):758-68.

(3) Canada Mortgage and Housing Corporation. [Internet]. Ottawa: Canada Mortgage and Housing Corporation; 2016. What is core housing need?[updated 2016 Mar 23; cited 2017 Mar 31]; [about 9 screens]. Available from: https://www.cmhc-schl.gc.ca/en/hoficlincl/observer/observer_044.cfm.

(4) Cooper S, Skelton I, Canadian Centre for Policy Alternatives--Manitoba, Canadian Electronic Library (Firm). Addressing core housing need in Canada. Winnipeg, Manitoba: Canadian Centre for Policy Alternatives, Manitoba Office; 2015.

(5) Statistics Canada. [Internet]. Ottawa: Statistics Canada; 2011. National Household Survey (NHS) [updated 2011 Oct 05; cited 2017 Mar 31]; [about 9 screens]. Available from: http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5178.

(6) du Prel JB, Hommel G, Röhrig B, Blettner M. Confidence interval or p-value?: Part 4 of a series on evaluation of scientific publications. Deutsches Ärzteblatt International. 2009;106(19):335.

(7) Co-operative Housing Federation of Canada. The Dunning report: Dimensions of core housing need in Canada, second edition [Internet]. Ottawa: Co-operative Housing Federation of Canada; 2009 Aug [cited 2017 Mar 31]. Available from: https://chfcanada.coop/wp-content/uploads/2017/05/DunningReport2009EnWeb.pdf.

(8) Chen J, Ng E, Wilkins R. The health of Canada's immigrants in 1994-95. Health rep. 1996 Spring;7 Cat. no. 82-003(4):33-46.

(9) Edwards C, Fillingim R, Keefe F. Race, ethnicity and pain. Pain. 2001 Nov;94(2):133-7.

(10) Canada Mortgage and Housing Corporation. Housing Affordability and Need: A chapter form the Canadian Housing Observer. Canadian Housing Observer 2014 Ottawa: Canada Mortgage and Housing Corporation; 2014.

(11) Canada Mortgage and Housing Corporation. Census/National Household Survey Housing Conditions Series: Issue 5 Inuit households in Canada. Ottawa: Canada Mortgage and Housing Corporation; 2015 Nov [cited 2017 Mar 31].

(12) Gaetz S, Gulliver T and Richter T. The state of homelessness in Canada 2014 [Internet]. Toronto: The Homeless Hub Press.; 2014 [cited 2017 Mar 31]. Available from: https://yorkspace.library.yorku.ca/xmlui/bitstream/handle/10315/29368/SOHC2014.pdf?sequence=1.

(13) Rauh VA, Landrigan PJ, Claudio L. Housing and health. Ann N Y Acad Sci. 2008;1136(1):276-88.

(14) Wood L. Housing and health: Unlocking opportunity [Internet]. Toronto: Toronto Public Health; 2016 Oct [cited 2017 Mar 31]. Available from: http://www.toronto.ca/legdocs/mmis/2016/hl/bgrd/backgroundfile-97428.pdf.

(15) Balestra C and Sultan J. Home sweet home: The determinants of residential satisfaction and its relation with well-being [Internet]. Paris: Organisation for Economic Cooperation and Development (OECD); 2013 [cited 2017 Mar 27]. Available from: http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=STD/DOC(2013)5&docLanguage=En.

(16) Statistics Canada. [Internet]. Statistics Canada; Visible minority [updated 2016 Available from: http://www12.statcan.gc.ca/nhs-enm/2011/ref/dict/pop127-eng.cfm.

HEALTH DETERMINANTS – STRUCTURAL DRIVERS

EARLY CHILDHOOD DEVELOPMENT

INEQUALITIES IN
EARLY CHILDHOOD DEVELOPMENT IN CANADA

INEQUALITIES HIGHLIGHTS

- Developmental vulnerability is a measure of how a kindergarten child performs on certain predictors of adult physical health and well-being.
- Across all social stratifiers, boys had higher percentages of development vulnerability in early childhood development than girls.
- The proportion of developmentally vulnerable kindergarten children living in the most materially and socially deprived neighbourhoods was 2.2 times the proportion of those living in the least materially and socially deprived neighbourhoods. This equates to 21.1% more children with development vulnerability in the most socially and materially deprived neighbourhoods compared with those in the least socially and materially deprived neighbourhoods.
- The proportion of developmentally vulnerable kindergarten children is 24 percentage points higher among those who identified as Indigenous than among non-Indigenous kindergarten children (48.9% vs 24.9%). This prevalence is 2.0 times that of non-Indigenous kindergarten children.
- The percentage of developmentally vulnerable kindergarten children living in lowest- income neighbourhoods who were vulnerable in at least one domain of the Early Development Instrument was 1.8 times that of children living in the highest-income neighbourhoods. This is equal to 15.7% more developmentally vulnerable kindergarten children among those living in the lowest-income neighbourhoods.

ACRONYM	FULL NAME
CI	Confidence Interval
EDI	Early Development Instrument
RR	Rate Ratio

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Early childhood refers to the period from age 0 to 5 years. Evidence suggests that in the early years, the brain undergoes significant changes and lays the foundation for future health and well-being (1). Developmental vulnerabilities have been shown to be associated with a number of health and social outcomes in later life, such as chronic diseases, mental health problems, literacy, and economic participation (2,3). Certainly, brain development is adversely affected by exposure to poverty (4,5).

Early childhood development is affected by a range of social, economic, and environmental factors, such as housing and neighbourhood conditions, parenting skills, parental education, and access to nutritious foods (6,7). Inequalities in access to supportive conditions across these domains can have a negative impact that may persist throughout life.

Early Development Indicator data indicate that approximately one-quarter of Canadian kindergarten children are vulnerable in at least one area of development prior to entering Grade 1 (8). These vulnerabilities, which are more prevalent in certain subpopulations, can predict literacy and numeracy outcomes in children up to 12 years old (9,10). At a societal level, interventions to improve healthy childhood development have been linked to economic growth and prosperity by breaking the cycle of inequality (11,12).

Early childhood development was selected as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter).

METHODS

The data used to assess early childhood development was derived from the Early Development Instrument (EDI), a validated and reliable population-level tool designed to obtain a teacher's assessment of a child's readiness for school, based on their knowledge and observations of the child during the kindergarten school year (when the child is 3.5 to 6.5 years old). Developed by the Offord Centre for Child Studies at McMaster University (13), the EDI consists of 103 questions and measures five core domains of early child development that are known to be good predictors of adult health, education, and social outcomes: physical health and well-being; social competence; emotional maturity; language and cognitive development; and communication skills and general knowledge.

Kindergarten children whose EDI scores fall in the lowest tenth percentile for a given domain are identified as "vulnerable" in that area; those with one or more vulnerabilities are considered vulnerable overall (14,15). These children are more likely to face challenges in school and learning than those who are not vulnerable (16,17).

Provinces and territories that collected EDI data for the entire province or territory at the time of the analysis for this report were British Columbia (data collected for the 2010/11 schoolyear), Saskatchewan (2010/11), Manitoba (2010/11), Ontario (2011/12), Quebec (2011/12), New Brunswick (2008/09), Prince Edward Island (2007/08), Yukon (2011/12), and Northwest Territories (2011/12). These provinces and territories represented 84.8% of the total Canadian population in 2011. About 258 000 kindergarten children were included in the analysis.

Inequalities in early childhood development were assessed by measuring differences in percentages of kindergarten children vulnerable in one or more developmental domains according to social stratifiers grouped under socioeconomic and sociodemographic stratifiers. Sociodemographic stratifiers include sex/gender, Indigenous identity, and rural/urban residence. Socioeconomic stratifiers include income, education, immigrant status, and social and material deprivation.

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported along with their 95% confidence intervals (CIs). Statistical significance was assessed using 95% confidence intervals (18). Sex/gender-specific inequalities for social stratifiers are reported only if the differences between boys and girls were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: rate ratio (RR), rate difference, attributable fraction, population attributable rate, population attributable fraction, and population impact number.

Few individual-level demographic and socioeconomic details are available in the EDI. Information about the child's development and sex and Indigenous identity[48] was completed by kindergarten teachers. Area-based measures were derived at the level of the dissemination area using data from the 2006 Census of Population to provide measures of inequality across social stratifiers. Consequently, these findings apply to the dissemination area level and not the level of the individual.

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups which result from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in the Canadian context. (For more detailed information on methods, see the Methodology chapter.)

FINDINGS

Evidence of inequalities for developmental vulnerability was observed for each social stratifier analysed for this report. There were higher percentages of developmentally vulnerable boys than of developmentally vulnerable girls across all social stratifiers. Highlighted are some of the most pronounced absolute and relative inequalities in early childhood development in various population groups. (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

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[48] In the EDI guide, the Early Development Instrument uses the term "Aboriginal," which includes First Nations living on and off reserve, Métis, or Inuit children (Janus et al., 2007). As a result, EDI data used in this report cannot distinguish between children's First Nations, Inuit, or Métis identity.

Indigenous Peoples

The proportion of kindergarten children who identified as Indigenous and who were vulnerable in at least one EDI domain was twice as high as the proportion of kindergarten children who were not identified as Indigenous (rate ratio [RR]=2.0, 95% CI: 1.9–2.0). This equates to 24 (95% CI: 23.1–25.0) per 100 more developmentally vulnerable Indigenous kindergarten children than non-Indigenous children (Figure 1).

If the same proportion of Indigenous kindergarten children as non-Indigenous kindergarten children were developmentally vulnerable, there would be approximately 2 756 (95% CI: 2 580–2 935) fewer Indigenous kindergarten children with developmental vulnerability in Canada in one year (Figure 1).

The relative inequalities in developmental vulnerability between Indigenous and non-Indigenous kindergarten children were higher among girls (RR=2.3; 95% CI: 2.2–2.3) than boys (RR=1.8; 95% CI: 1.8–1.9). However, at 57.8% (56.5–59.0%), Indigenous boys had the highest vulnerability in at least one developmental domain from among all Indigenous and non-Indigenous children.

Immigrant Status

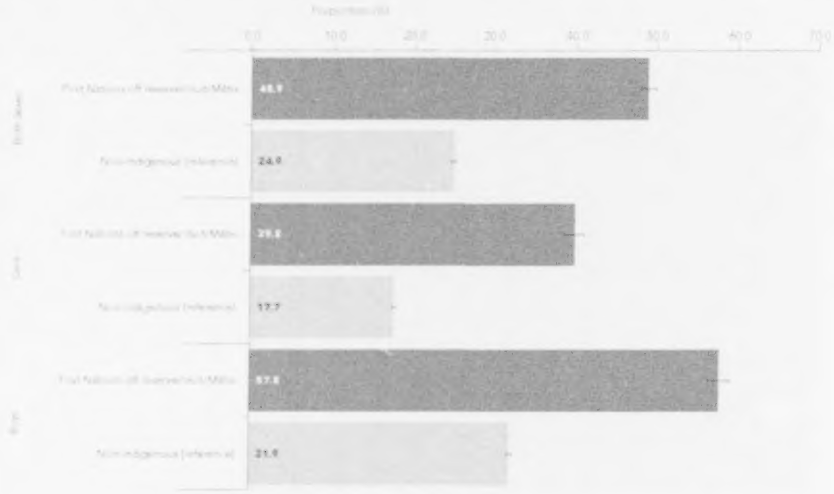
The percentage of developmentally vulnerable kindergarten children living in areas with a high proportion of foreign-born residents was 1.2 (95% CI: 1.2–1.3) times the percentage of developmentally vulnerable kindergarten children living in neighbourhoods with a low foreign-born population. This means that there were 5.7 (95% CI: 5.1– 6.2) per 100 more kindergarten children with developmental vulnerability in neighbourhoods that had a high proportion of foreign-born residents compared with kindergarten children in neighbourhoods that had a low proportion of foreign-born residents (Figure 2).

If the proportion of developmentally vulnerable kindergarten children living in neighbourhoods with a high foreign-born population had been as low as in neighbourhoods with a low foreign-born population, this proportion of developmentally vulnerable kindergarten children would be reduced by 18.5% (95 CI: 17.0–20.0%) in neighbourhoods with a high foreign-born population. This would result in a 2.8% (95% CI: 2.5–3.1%) reduction in the proportion of developmentally vulnerable kindergarten children in Canada.

The ratio of the percentage of developmentally vulnerable kindergarten children living in areas with a high proportion of foreign-born residents compared with the ratio of the percentage in areas with a low proportion of foreign-born residents was similar for both boys and girls—1.2 (95% CI: 1.2–1.2) versus 1.3 (95% CI: 1.3–1.4). However, the proportion of developmentally vulnerable boys was higher than the proportion of developmentally vulnerable girls in each neighbourhood type analysed. This difference was most pronounced in neighbourhoods with a high proportion of foreign-born residents; in these neighbourhoods, the percentage of developmentally vulnerable boys was 37.7% (95% CI: 36.9–38.4%) compared with 23.2% (95% CI: 22.6–23.9%) of girls (Figure 2).

FIGURE 1

Vulnerability in at Least One Early Developmental Instrument Domain by Indigenous Identity and Sex/Gender, Canada, ages 4–6 years, 2007–2012

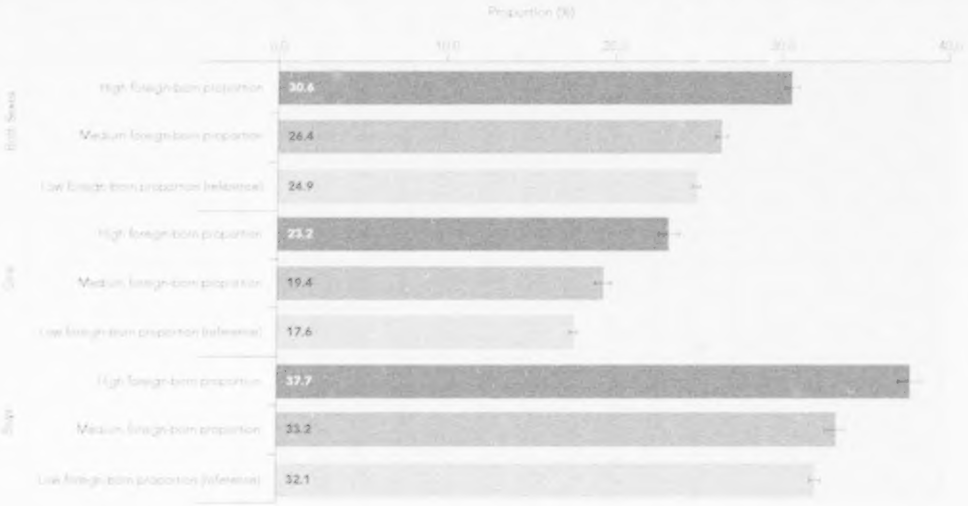


	PROPORTION RATIO (PR)	PROPORTION DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
BOTH SEXES						
First Nations off reserve/Inuit/Métis	2.0*	24.0*	49.2*	4.2*	1.1*	2 756*
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0
GIRLS						
First Nations off reserve/Inuit/Métis	2.3*	22.1*	55.6*	5.4*	1.0*	1 254*
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0
BOYS						
First Nations off reserve/Inuit/Métis	1.8*	25.9*	44.9*	3.6*	1.2*	1 501*
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Ecological stratification for the Early Development Instrument data was derived using the 2006 Census of Population.
Source: Early Development Instrument, McMaster University's Offord Centre for Child Studies (2007–2012)

FIGURE 2

Vulnerability in at Least One Early Developmental Instrument Domain by Immigrant Status and Sex/Gender, Canada, ages 4–6 years, 2007–2012



	PROPORTION RATIO (PR)	PROPORTION DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
BOTH SEXES						
High foreign-born proportion	1.2*	5.7*	18.5*	2.8*	0.7*	1 855*
Medium foreign-born proportion	1.1*	1.5*	5.7*	1.1*	0.3*	717*
Low foreign-born proportion [reference]	1.0	0.0	0.0	0.0	0.0	0
GIRLS						
High foreign-born proportion	1.3*	5.6*	24.2*	3.9*	0.7*	906*
Medium foreign-born proportion	1.1*	1.7*	9.0*	1.7*	0.3*	406*
Low foreign-born proportion [reference]	1.0	0.0	0.0	0.0	0.0	0
BOYS						
High foreign-born proportion	1.2*	5.6*	14.9*	2.2*	0.7*	932*
Medium foreign-born proportion	1.0*	1.2*	3.5*	0.7*	0.2*	280*
Low foreign-born proportion [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Area-level measures of immigrant status derived from the 2006 Census of Population
Ecological stratification for the Early Development Instrument data was derived using the 2006 Census of Population.
Source: Early Development Instrument, McMaster University's Offord Centre for Child Studies (2007–2012)

Income

There was a clear gradient between increasing proportion of children's developmental vulnerability and decreasing neighbourhood income. While the inequalities described here are for the two income groups at opposite extremes, it is worth noting that important inequalities are evident in all of the income groups.

The percentage of kindergarten children living in the lowest-income neighbourhoods who were vulnerable in at least one EDI domain was 1.8 (95% CI: 1.8–1.8) times the percentage of kindergarten children living in the highest-income neighbourhoods. There were 15.7 (95% CI: 15.1– 16.2) per 100 more kindergarten children with developmental vulnerability living in the lowest-income neighbourhoods than those living in the highest-income neighbourhoods (Figure 3).

If the proportion of developmentally vulnerable kindergarten children living in the lowest-income neighbourhoods was as low as that in the highest-income neighbourhoods, this proportion would be reduced by 44.7% (95% CI: 43.5–45.9%) in the lowest-income neighbourhoods. This would result in an 11.3% (95% CI: 10.9–11.7%) decrease in the overall percentage of developmentally vulnerable kindergarten children. In theory, there would be 7 511 (95% CI: 7 141–7 886) fewer cases of developmental vulnerability in Canadian kindergarten children in one year. In lowest-income neighbourhoods, 42.9% (95% CI: 42.3–43.5%) of boys were found to be developmentally vulnerable compared with 27.2% (95% CI: 26.7–27.8%) of girls (Figure 3).

A larger relative inequality was observed among girls than among boys. The proportion of developmentally vulnerable girls living in low-income neighbourhoods was 2.1 (95% CI: 2.0–2.2) times that in high-income neighbourhoods. In comparison, the proportion of developmentally vulnerable boys living in low-income neighbourhoods was 1.7 (95% CI: 1.6–1.7) times that in high-income neighbourhoods. On the absolute scale, however, boys fared worse than girls: there were 17.3 (95% CI: 16.5–18.1) per 100 more boys with vulnerabilities living in low-income neighbourhoods than boys with vulnerabilities living in the highest-income neighbourhoods. For girls, this difference was 14.2 (95% CI: 13.5–14.9) per 100 kindergarten children.

Education

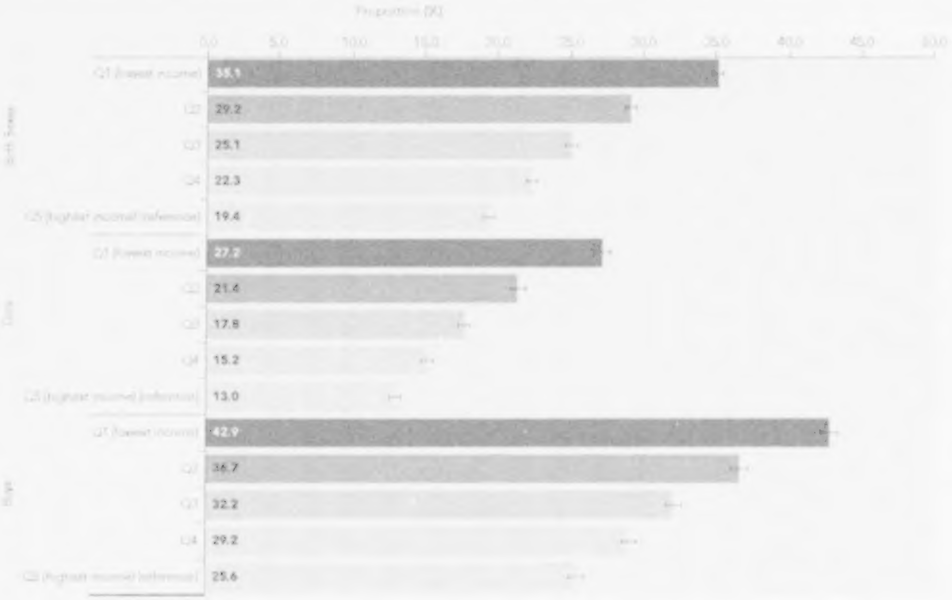
Living in a neighbourhood with lower overall educational attainment was also associated with a child's level of developmental vulnerability, with the pattern of inequalities similar to that observed by income. Kindergarten children living in neighbourhoods with the lowest average levels of educational attainment had 1.3 (95% CI: 1.2–1.3) times the proportion of vulnerability in at least one domain of development compared with kindergarten children living in neighbourhoods with the highest educational attainment (Figure 4).

If the percentage of developmentally vulnerable kindergarten children living in the lowest-education neighbourhoods was as low as that in the highest-education neighbourhoods, this percentage would be reduced by 20.4% (95% CI: 18.6–22.0%). Therefore, the proportion of developmentally vulnerable kindergarten children in Canada would decrease by 4.4% (95% CI: 4.0–4.9%), which would potentially result in 2 941 (95% CI: 2 600–3 286) fewer cases of developmental vulnerability in one year.

Boys were more vulnerable than girls across all education quintiles, although relative inequality was greater among girls. The proportion of developmentally vulnerable girls in the lowest-education neighbourhoods was 1.3 (95% CI: 1.3–1.4) times that in high-education neighbourhoods; the proportion of developmentally vulnerable boys living in low-education neighbourhoods was 1.2 (95% CI: 1.2–1.2) times that in high-education neighbourhoods. On the absolute scale, however, boys again fared worse than girls. There were 6.3 (95% CI: 5.5–7.2) per 100 more boys with vulnerabilities in the lowest education quintile than in the highest education quintile. For girls, this difference was 5.4 (95% CI: 4.7–6.1) per 100.

FIGURE 3

Vulnerability in at Least One Early Developmental Instrument Domain by Income Quintile and Sex/Gender, Canada, ages 4–6 years, 2007–2012

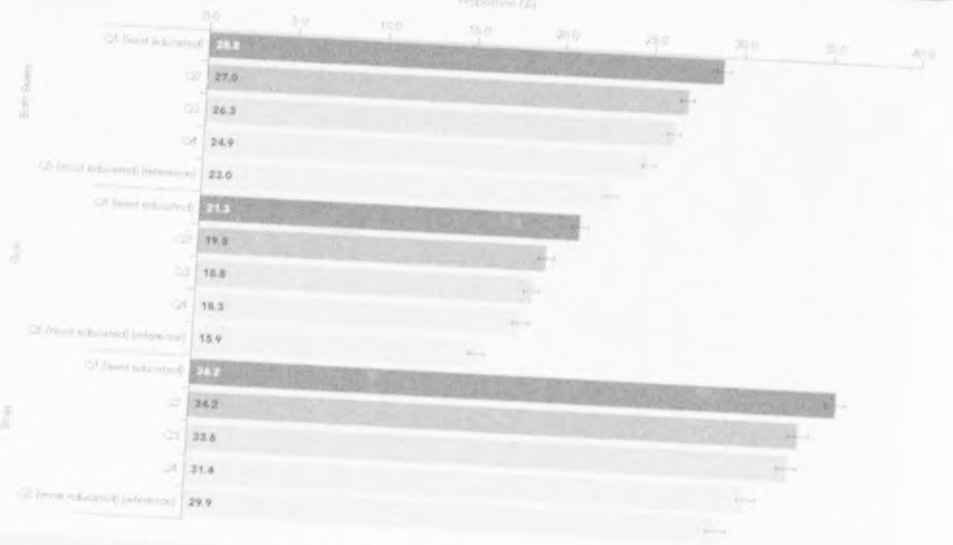


	PROPORTION RATIO (PR)	PROPORTION DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
BOTH SEXES						
Q1 (lowest income)	1.8*	15.7*	44.7*	11.3*	2.9*	7 511*
Q2	1.5*	9.8*	33.4*	7.1*	1.8*	4 722*
Q3	1.3*	5.7*	22.5*	4.4*	1.2*	2 952*
Q4	1.1*	2.9*	12.9*	2.4*	0.6*	1 604*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
GIRLS						
Q1 (lowest income)	2.1*	14.2*	52.1*	14.3*	2.7*	3 387*
Q2	1.6*	8.4*	39.1*	8.4*	1.6*	1 992*
Q3	1.4*	4.7*	26.6*	5.2*	1.0*	1 220*
Q4	1.2*	2.2*	14.4*	2.6*	0.5*	610*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0
BOYS						
Q1 (lowest income)	1.7*	17.3*	40.3*	9.7*	3.2*	4 155*
Q2	1.4*	11.1*	30.2*	6.4*	2.1*	2 730*
Q3	1.3*	6.6*	20.5*	4.1*	1.3*	1 743*
Q4	1.1*	3.6*	12.5*	2.4*	0.8*	1 025*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
*: Significantly different from reference category
Area-level measures of the income quintiles derived from the 2006 Census of Population
Ecological stratification for the Early Development Instrument data was derived using the 2006 Census of Population.
Source: Early Development Instrument, McMaster University's Offord Centre for Child Studies (2007–2012)

FIGURE 4

Vulnerability in at Least One Early Developmental Instrument Domain by Education Quintile and Sex/Gender, Canada, ages 4–6 years, 2007–2012



BOTH SEXES	PROPORTION RATIO (PR)	PROPORTION DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Q1 (least educated)	1.3*	5.9*	20.4*	4.4*	1.2*	2 941*
Q2	1.2*	4.0*	14.8*	3.1*	0.8*	2 085*
Q3	1.1*	3.3*	12.6*	2.6*	0.7*	1 716*
Q4	1.1*	2.0*	7.8*	1.5*	0.4*	1 005*
Q5 (most educated) [reference]	1.0	0.0	0.0	0.0	0.0	0
GIRLS						
Q1 (least educated)	1.3*	5.4*	25.2*	5.6*	1.1*	1 328*
Q2	1.2*	3.6*	18.5*	3.9*	0.7*	932*
Q3	1.2*	2.9*	15.3*	3.1*	0.6*	737*
Q4	1.2*	2.4*	13.1*	2.6*	0.5*	614*
Q5 (most educated) [reference]	1.0	0.0	0.0	0.0	0.0	0
BOYS						
Q1 (least educated)	1.2*	6.3*	17.5*	3.8*	1.2*	1 607*
Q2	1.1*	4.4*	12.8*	2.7*	0.9*	1 154*
Q3	1.1*	3.7*	11.2*	2.3*	0.8*	982*
Q4	1.1*	1.6*	5.0*	1.0*	0.3*	407*
Q5 (most educated) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
*: Significantly different from reference category
Area-level measures of education quintiles derived from the 2006 Census of Population
Ecological stratification for the Early Development Instrument data was derived using the 2006 Census of Population.
Source: Early Development Instrument, McMaster University's Offord Centre for Child Studies (2007–2012)

Material and Social Deprivation

The percentage of developmentally vulnerable kindergarten children living in the most socially and materially deprived[49] areas of Canada was 2.2 (95% CI: 2.1–2.3) times the percentage of those living in the least socially and materially deprived areas. This represented 21.1 (95% CI: 19.9–22.3) per 100 more kindergarten children with developmental vulnerability living in the most socially and materially deprived areas of Canada than in the least deprived areas (Figure 5).

If the proportion of developmentally vulnerable kindergarten children living in the most socially and materially deprived areas was the same as the proportion living in the least deprived areas, the overall proportion of kindergarten children with developmental vulnerability in Canada would be reduced by 3.4% (95% CI: 3.2–3.6%). This would result in 2 217 (95% CI: 2 051–2 385) fewer cases of developmental vulnerability among kindergarten children in Canada in one year.

Relative inequalities in developmental vulnerability by material and social deprivation were more pronounced among girls than boys (RR = 2.8; 95% CI: 2.5–3.0 versus RR = 2.0; 95% CI: 1.9–2.1). However, the absolute size of the inequality was greater among boys (22.8 per 100 for boys versus 19.7 per 100 for girls). This is because developmental vulnerability is more frequent in boys than in girls.

Rural/Urban Residence

Differences in child developmental vulnerability were noted by rural/urban residence[50]. Remote areas and the three largest cities in Canada (Toronto, Montréal, and Vancouver, combined) had the highest proportion of developmentally vulnerable kindergarten children: 28.9% (95% CI: 28.2–29.6%) and 28.7% (95% CI: 28.4–29.1), respectively. At 23.9% (95% CI: 23.7–24.2%), large urban centres other than Toronto, Montréal, and Vancouver had the lowest proportion of developmentally vulnerable kindergarten children (Figure 6). The percentage of developmentally vulnerable kindergarten children living in rural areas and in the three largest cities was 1.2 (95% CI: 1.2–1.2) times the proportion of developmentally vulnerable kindergarten children living in large urban centres other than Toronto, Montréal, and Vancouver (Figure 6).

If the proportion of developmentally vulnerable kindergarten children living in rural locations was as low as the proportion living in urban centres other than Toronto, Montréal, and Vancouver, there would be 769 (95% CI: 624–918) fewer developmentally vulnerable kindergarten children in one year in Canada. However, if the percentage of developmentally vulnerable kindergarten children living in Toronto, Montréal, or Vancouver was as low as that in urban centres other than these three cities, there would be 2 654 (95% CI: 2 342–2 970) fewer developmentally vulnerable kindergarten children in one year in Canada.

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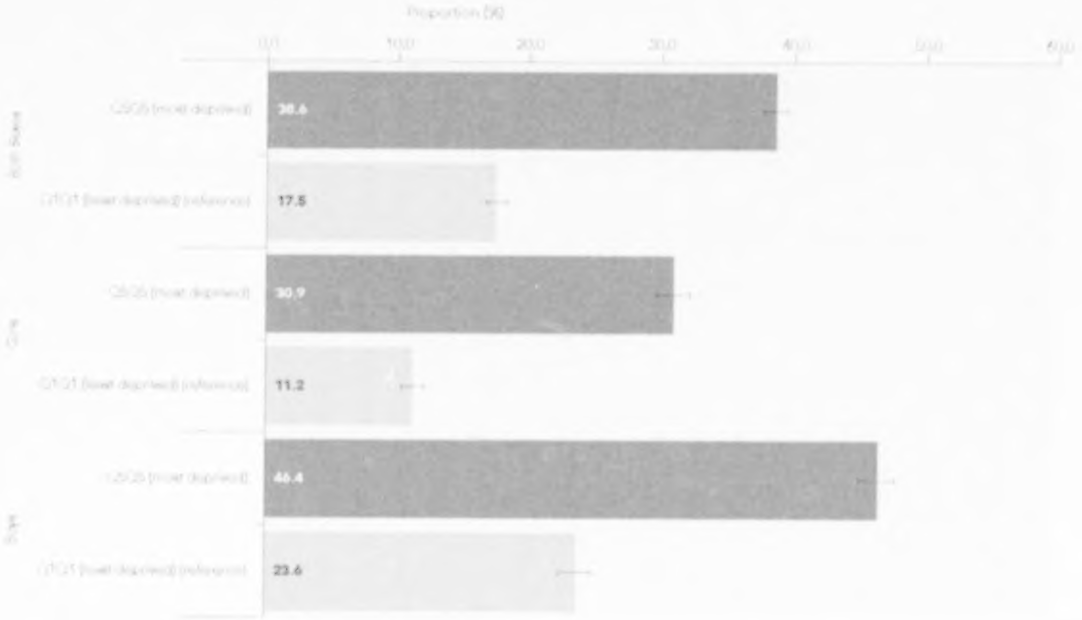
[49] For a definition of the deprivation index, see the Methodology chapter.

[50] For definitions of rural/urban subgroups, see the Methodology chapter.

FIGURE 5

Vulnerability in at Least One Early Developmental Instrument Domain by Deprivation Index (material and social) and Sex/Gender, Canada, ages 4–6 years, 2007–2012

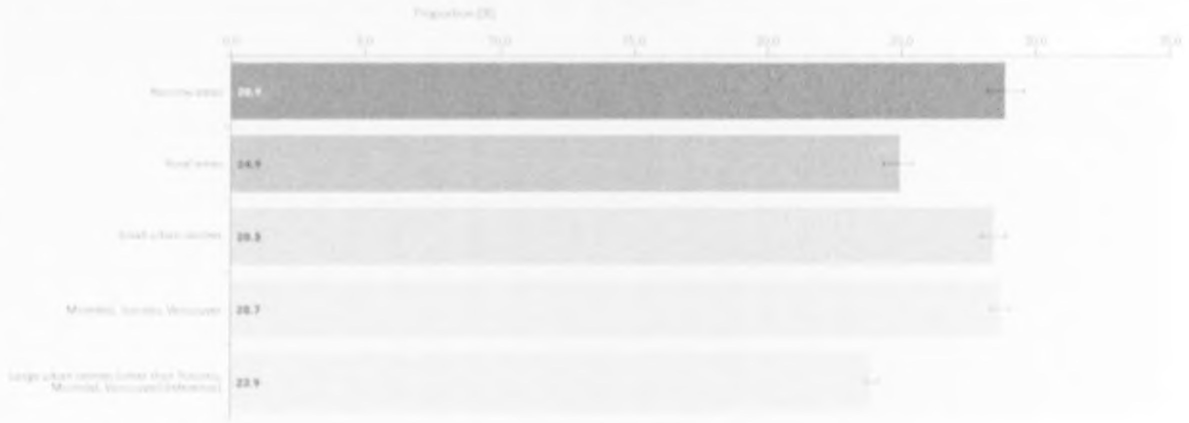


	PROPORTION RATIO (PR)	PROPORTION DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
BOTH SEXES						
Q5Q5 (most deprived)	2.2*	21.1*	54.8*	3.4*	0.9*	2 217*
Q1Q1 (least deprived) [reference]	1.0	0.0	0.0	0.0	0.0	0
GIRLS						
Q5Q5 (most deprived)	2.8*	19.7*	63.8*	4.5*	0.8*	1 041*
Q1Q1 (least deprived) [reference]	1.0	0.0	0.0	0.0	0.0	0
BOYS						
Q5Q5 (most deprived)	2.0*	22.8*	49.2*	2.8*	0.9*	1 189*
Q1Q1 (least deprived) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
*: Significantly different from reference category
Area-level measures of deprivation index derived from the 2006 Census of Population
Ecological stratification for the Early Development Instrument data was derived using the 2006 Census of Population.
Source: Early Development Instrument, McMaster University's Offord Centre for Child Studies (2007–2012)

FIGURE 6

Vulnerability in at Least One Early Developmental Instrument Domain by Rural/Urban Residence, Canada, ages 4–6 years, 2007–2012



	PROPORTION RATIO (PR)	PROPORTION DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Remote areas	1.2*	4.9*	17.1*	1.2*	0.3*	769*
Rural areas	1.0*	0.9*	3.8*	0.4*	0.1*	257*
Small urban centres	1.2*	4.5*	15.9*	2.4*	0.6*	1 614*
Montréal, Toronto, Vancouver	1.2*	4.8*	16.7*	4.0*	1.0*	2 654*
Large urban centres (other than Toronto, Montréal, Vancouver) [reference]	1.0	0.0	0.0	0.0	0.0	0

* Significantly different from reference category.
Ecological stratification for the Early Development Instrument data was derived using the 2006 Census of Population.
Source: Early Development Instrument, McMaster University's Offord Centre for Child Studies 2007–2012.

DATA GAPS/LIMITATIONS

Early childhood development was assessed using the EDI, a widely accepted, reliable population-level tool, with demonstrated high predictive validity. It is important to note that the EDI is completed by the kindergarten teacher; as such, it is a reflection of teachers' perceptions of children's behaviours and skills. Testing of bias in reporting by teachers has included testing of between-group reliability. No systematic differences in measurement by Indigenous identity or sex/gender were observed, with the exception of physical aggression, which was more likely in boys than girls (19). However, future research into Indigenous ways of sharing oral knowledge and establishing meaning has been recommended to inform the EDI of Indigenous values about knowledge sharing (20). It is also important to note that EDI results for indigenous children presented in this report do not include those living in First Nations communities.

The EDI could not be stratified according to disability and cultural/racial background due to lack of area-based measures for this analysis. This has resulted in a gap in reporting on EDI inequalities for these groups.

An important limitation of using area-based measures to define social groups is that these are aggregated at the dissemination area level and hence rely on the assumption that sociodemographic and socioeconomic groups are uniform. Their use can lead to misclassification bias and underestimation of inequalities. Although the directions of disparities may be the same in studies that use area-based measures and individual-level measures, research has shown that the size of the disparities is much larger when measured at the level of the individual (21). (For more information on area-based measures, see Methodology.)

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (18), calculating *p*-values would confirm statistically significant differences.

Finally, data are not available in all years or for all provinces and territories, but span a five-year period (2007–2012). As a result, national estimates are based on the inclusion of the provincial and territorial collections for the most recent years in which the EDI was implemented at the time of this analysis.

Although the report refers to Canada, data were missing for three provinces (Alberta, Nova Scotia, Newfoundland and Labrador) and one territory (Nunavut). Population impact numbers are therefore underestimates for Canada as a whole. Furthermore, as data apply to only a single year of childhood, the number of all Canadian schoolchildren who are developmentally vulnerable is therefore much higher.

DISCUSSION

Currently, 27% of Canadian kindergarten children are vulnerable in at least one developmental domain (8). Our research identified considerable differences in the proportion of developmentally vulnerable children based on a variety of socioeconomic and sociodemographic characteristics. The inequalities observed were generally more pronounced at the neighbourhood level for income, material and social deprivation, and for Indigenous identity; the inequalities were more moderate for proportion of foreign-born, rural/urban residence, and level of education. Across all social stratifiers, boys had higher percentages of developmental vulnerability than did girls. Boys were also found to be at higher risk of developmental vulnerability in Australia (22), Scotland (10), and China (23).

For both education and income, the inequalities showed a stepwise gradient, where the proportion of children experiencing developmental vulnerability increased as level of education or income decreased. This is consistent with earlier findings (also using the EDI) that showed that living in a lower-income neighbourhood is associated with higher vulnerability: the proportion of children in low-income neighbourhoods with developmental vulnerability was higher (34.9%) than those in high-income neighbourhoods (19.5%) (8).

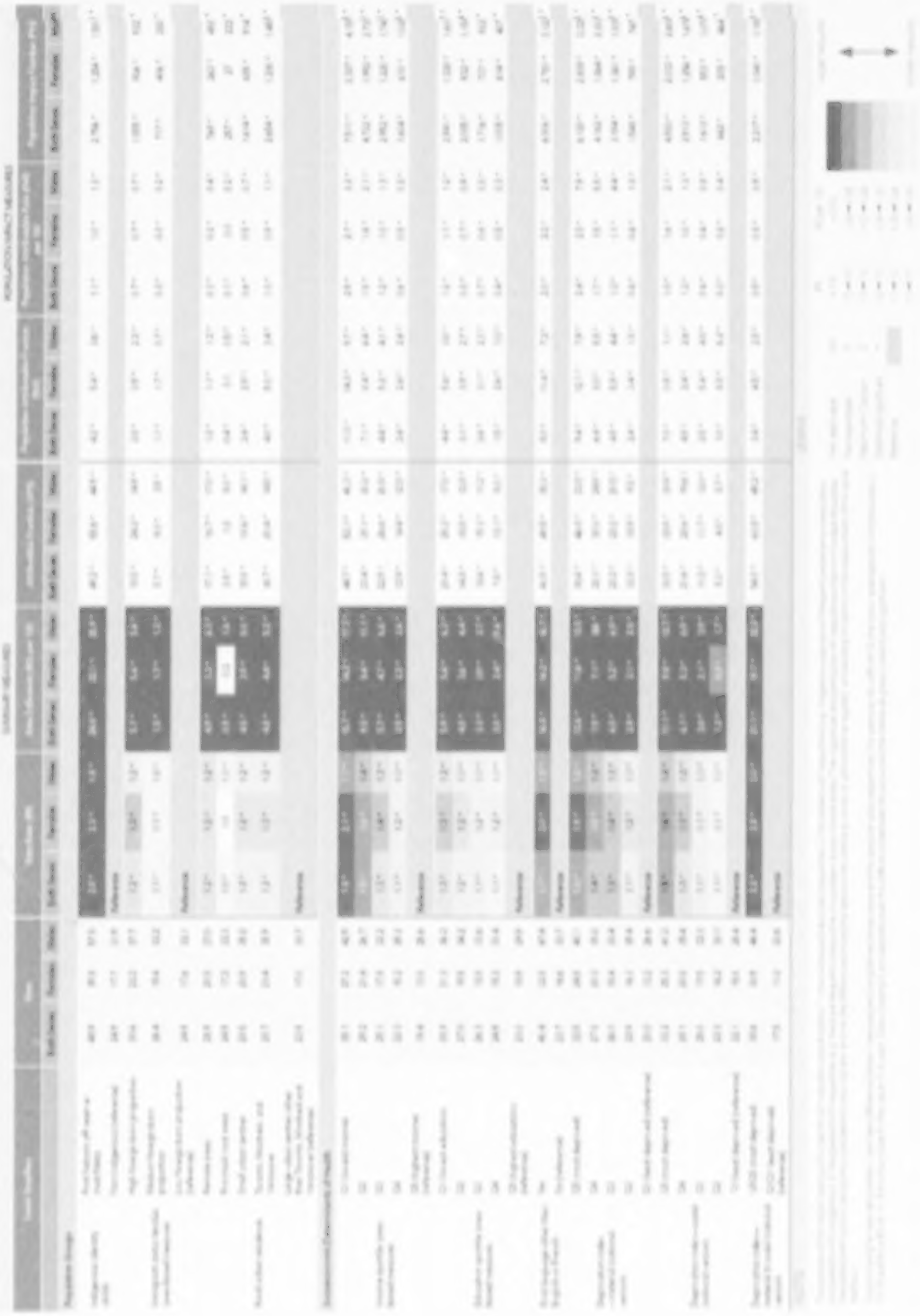
Children living in disadvantaged socioeconomic conditions are at higher risk for developmental vulnerabilities through a number of possible pathways. These include differences in skills and knowledge of caregivers, lower rates of breastfeeding, higher rates of parental stress, inadequate housing, less neighbourhood safety, and lower quality of child care (24,25).

The proportion of children who were vulnerable in at least one developmental domain was twice as high for Indigenous children as for non-Indigenous children. Similarly, Indigenous children in Australia are more than twice as likely to be developmentally vulnerable than non-Indigenous children (22). The inequalities observed between Indigenous and non-Indigenous children may at least partially reflect differences in socioeconomic and living conditions. For example, more Indigenous children than non-Indigenous children in Canada live in low-income households (38% versus 17%) (26). Many Indigenous communities experience high unemployment, poor housing, poverty, and inadequate health care services, challenges that are the sequelae of a history of colonization, residential schools, isolation, loss of cultural identity, stigmatization, and language barriers.

Indigenous kindergarten children and those living in the most materially and socially deprived neighbourhoods were much more likely to be developmentally vulnerable than non-Indigenous children and those living in the least materially and socially deprived neighbourhoods. There is a strong body of evidence that interventions, especially those associated with living in socioeconomically disadvantaged conditions, early on in a child's life before school entry can reduce inequalities over the life course (27,28).

Early childhood is a crucial time of physical, cognitive, social, emotional, and language development. Developmental vulnerabilities present in early childhood have been linked to a number of health and social outcomes in later life including chronic diseases, mental health problems, literacy, and economic participation (25). Inequalities observed via the Early Development Instrument (EDI) are prevalent across a range of individual and social stratifiers. Although developmental vulnerabilities are found among children living in neighbourhoods with a high concentration of Indigenous people or foreign-born residents or with the highest levels of social and material deprivation, a higher prevalence of developmentally vulnerable boys is found across all stratifiers. There is also a clear socioeconomic gradient evident, with inequalities increasing as neighbourhood incomes and education levels decrease. The broader social, economic, and environmental conditions that can impact early development encompass several determinants of health such as housing and neighbourhood conditions, parenting skills, parental education, and access to nutritious foods. The inequalities observed in EDI across populations and the long-term impact of vulnerability among children as detected by the EDI can potentially be reduced with targeted activities. However, addressing these inequalities will require policy interventions that address the broader social and economic structural determinants of health such as parental employment and social protection, high quality early education, parental support, and leave-arrangements policies (6,7,25). Systematic and ongoing measurement and monitoring of inequalities in EDI is needed to inform and strengthen policies, interventions, programs, and research targeting the social determinants of inequalities in vulnerability among young children while also documenting how the inequalities change over time.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Children Vulnerable in at least one Domain of Early Development. Data Source: Early Development Instrument, McMaster University's Offord Centre for Child Studies (2007–2012).



References

(1) McCain M, Mustard J and McCuaig K. Early Years Study 3: Making decisions, taking action. [Internet]. Toronto: Margaret & Wallace McCain Family Foundation; 2011 [cited 2017 Mar 13]. Available from: http://ecereport.ca/media/uploads/pdfs/early-years-study3-2011.pdf.

(2) Gluckman PD, Hanson MA, Cooper C, Thornburg KL. Effect of in utero and early-life conditions on adult health and disease. N Engl J Med. 2008 07/03; 2017/01;359(1):61-73.

(3) Shonkoff JP, Garner AS, Committee on Psychosocial Aspects of Child and Family Health, Committee on Early Childhood, Adoption, and Dependent Care and Section on Developmental and Behavioral Pediatrics. The lifelong effects of early childhood adversity and toxic stress [Internet]. United States: American Academy of Pediatrics; 2012 Available from: http://pediatrics.aappublications.org/content/pediatrics/129/1/e232.full.pdf.

(4) Luby J, Belden A, Boterton K, Marrus N, Harms M, Babb C, et al. The effects of poverty on childhood brain development: The mediating effect of caregiving and stressful life events. JAMA Pediatr. 2013;167(23):1135-42.

(5) Noble KG, Houston SM, Brito NH, Bartsch H, Kan E, Kuperman JM, et al. Family income, parental education and brain structure in children and adolescents. Nat Neurosci. 2015 05; 2017/11;18:773+.

(6) Cushon JA, Vu LT, Janzen BL, Muhajarine N. Neighborhood poverty impacts children's physical health and well-being over time: Evidence from the Early Development Instrument. Early Education and Development. 2011;22(2):183-205.

(7) Li J, D'Angiulli A, Kendall GE. The Early Development Index and children from culturally and linguistically diverse backgrounds. Early Years. 2007;27(3):221-35.

(8) Canadian Institute for Health Information. [Internet]. Ottawa, ON: Canadian Institute for Health Information; 2014. Children vulnerable in areas of early development: A determinant of child health Available from: https://secure.cihi.ca/free_products/Children_Vulnerable_in_Areas_of_Early_Development_EN.pdf.

(9) Brinkman S, Gregory T, Harris J, Hart B, Blackmore S, Janus M. Associations between the Early Development Instrument at age 5, and reading and numeracy skills at ages 8, 10 and 12: a prospective linked data study. Child Indicators Research. 2013 12/01;6(4):695-708.

(10) Woolfson LM, Geddes R, McNicol S, Booth JN, Frank J. A cross-sectional pilot study of the Scottish early development instrument: a tool for addressing inequality. BMC Public Health. 2013 12/17; 2017/11;13:1187.

(11) Kershaw P, Warburton B, Anderson L, Hertzman C, Irwin LG, Forer B. The economic costs of early vulnerability in Canada. CJPH. 2010;101(3):S8-S12.

(12) Commission on the Social Determinants of Health. Early Child Development: a powerful equalizer [Internet]. World Health Organization; 2007 Available from: http://apps.who.int/iris/bitstream/10665/69729/1/a91213.pdf.

(13) Offord Centre for Child Studies. [Internet]. 2015. What is the EDI?[updated 2015 Available from: https://edi.offordcentre.com/about/what-is-the-edi/.

(14) Janus M, Brinkman S, Duku E, Hertzman C, Santos R, Sayers M, et al. The Early Development Instrument: A population-based measure for communities. A handbook on development, properties, and use. 2007.

(15) Janus M, Offord DR. Development and psychometric properties of the Early Development Instrument (EDI): A measure of children's school readiness. Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement. 2007;39(1):1-22.

(16) Guhn M, Gadermann AM, Almas A, Schonert-Reichl KA, Hertzman C. Associations of teacher-rated social, emotional, and cognitive development in kindergarten to self-reported wellbeing, peer relations, and academic test scores in middle childhood. Early Childhood Research Quarterly. 2016 2nd Quarter 2016;35 (Supplement C):76-84.

(17) Davies S, Janus M, Duku E, Gaskin A. Using the Early Development Instrument to examine cognitive and non-cognitive school readiness and elementary student achievement. Early Childhood Research Quarterly 2016 2nd Quarter 2016;35(Supplement C):63-75.

(18) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(19) Guhn M, Gadermann A, Zumbo BD. Does the EDI measure school readiness in the same way across different groups of children? Early Education and Development. 2007 10/11;18(3):453-72.

(20) Sam MA. An Indigenous knowledges perspective on valid meaning making: A commentary on research with the EDI and Aboriginal communities. Soc Indicators Res. 2011 04/27;103(2):315.

(21) Pampalon R, Hamel D and Gamache P. A comparison of individual and area-based socio-economic data for monitoring social inequalities in health [Internet]. Statistics Canada; 2009 Available from: http://search.proquest.com/docview/207495271/fulltextPDF/5D91ED51C-4914C5DPQ/1?accountid=27430.

(22) Australian Government. A snapshot of early childhood development in Australia 2012 — AEDI national report. Canberra: 2013 .

(23) Ip P, Rao N, Bacon-Shone J, Ling-Li S, Ka-wing Ho F, Chow C, et al. Socioeconomic gradients in school readiness of Chinese preschool children: The mediating role of family processes and kindergarten quality. 2016;35:111-123.

(24) Brownell MD, Ekuma O, Nickel NC, Chartier M, Koseva I, Santos RG. A population-based analysis of factors that predict early language and cognitive development. Early Childhood Research Quarterly. 2016 2nd Quarter 2016;35(Supplement C):6-18.

(25) Irwin L, Siddiqi A and Hertzman C. Early child development: a powerful equalizer. World Health Organization; 2007 [cited 16 November, 2017].

(26) Macdonald D and Wilson D. Shameful neglect: Indigenous child poverty in Canada [Internet]. Canada: Canadian Center for Policy Alternatives; 2016 Available from: https://www.policyalternatives.ca/sites/default/files/uploads/publications/National%20Office/2016/05/Indigenous_Child%20_Poverty.pdf.

(27) Magnuson K, Duncan GJ. Can early childhood interventions decrease inequality of economic opportunity? Journal of the Social Sciences. 2016 May;2(2):123-41.

(28) Deming D. Early childhood intervention and life-cycle skill development: Evidence from Head Start. 2009;1(3):111.

HEALTH DETERMINANTS – STRUCTURAL DRIVERS

SOCIAL INEQUITIES

INEQUALITIES IN
HOUSEHOLD FOOD INSECURITY IN CANADA

INEQUALITIES HIGHLIGHTS

- A household is food-insecure when at least one member does not have the variety or quantity of food they need due to lack of money.
- Household food insecurity increases dramatically as household income decreases.
- Among adults in households where none of its members had completed high school, the prevalence of household food insecurity is 8.5 times that of adults in households where at least one member has a university degree. There are 22.1 more adults living with food insecurity in households with members who have the lowest education level than adults in households where at least one member has a university degree, per 100 adults.
- The prevalence of household food insecurity among adults who are unable to work is 5.9 times that of employed adults. This corresponds to 26.2 more adults living with food insecurity among those who are unable to work than among those who are employed, per 100 adults.
- Adults with severe functional health impairments are 5.1 times more likely to experience household food insecurity than adults without impairments. This means there are 15.2 more adults living with food insecurity among those who had severe functional health impairments than among adults without impairments, per 100 adults.
- The prevalence of household food insecurity among Inuit, First Nations living off reserve, and Métis adults was 3.7, 2.7, and 2.2 times the prevalence among non-Indigenous adults, respectively. This corresponds to 18.0 more Inuit, 11.5 more First Nations living off reserve, and 8.0 more Métis adults living in a food-insecure household than non-Indigenous adults, per 100 adults.
- Bisexual adults have a prevalence of household food insecurity 2.9 times that of heterosexual adults. This corresponds to 15.4 more bisexual adults living with food insecurity than heterosexual adults, per 100 adults.
- Canadians aged 12 to 17 years have the highest prevalence of household food insecurity (10.2%) among all age groups.

ACRONYM	FULL NAME
APS	Aboriginal Peoples Survey
CI	Confidence Interval
CCHS	Canadian Community Health Survey
FNIGC	First Nations Information Governance Centre
PR	Prevalence Ratio
RHS	First Nations Regional Health Survey

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Food insecurity in a household exists when at least one member of that household does not have the variety or quantity of food they need due to lack of money (1,2). Household food insecurity is a sensitive measure of household income; the lower the income, the higher the risk of compromised quality or reduced food intake and disrupted eating patterns (3). Further, food insecurity is a sensitive measure of material deprivation and is closely related to other measures of social and economic disadvantage.

Between 2007/8 and 2011/12, the household-level prevalence of moderate and severe food insecurity in Canadian households rose from 7.7% to 8.3% (4).

Social determinants of health, including food insecurity, tend to cluster (5). In Canada, the prevalence of household food insecurity varies according to geographical location, household composition, income, and reliance on government benefits (excluding the Canada Pension) (6). Food insecurity is associated with a diet that is less varied, has a lower intake of fruits and vegetables, and is nutritionally inadequate (7,8). In adults, food insecurity is linked to a variety of adverse health outcomes, including diabetes (9) and depression (10), as well as an increased reliance on the health care system (11).

Household food insecurity was selected as one indicator of key health inequalities in Canada. (For more information on how the key health inequality indicators were selected, see the Methodology chapter.)

METHODS

Data on household food insecurity prevalence and stratifier variables were collected through the Canadian Community Health Survey (CCHS) between 2009 and 2012. The exceptions were New Brunswick and Prince Edward Island, for which only 2011/12 data were available. Questions on household food insecurity were answered by adult respondents if the selected CCHS respondent was under 18 years old. Statistics Canada measures household food insecurity through a series of 18 questions (Household Food Security Survey Module)[51] and assesses whether households were able to afford food of adequate quality and quantity over the previous 12 months. Although household characteristics are also important in the context of food security, to maintain consistency with other report chapters, analysis for this chapter focused on sociodemographic and socioeconomic characteristics of individual respondents with household food insecurity. Respondents were classified into one of three groups:

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51. For more details on the Household Food Security Survey Module, please see: http://www.hc-sc.gc.ca/fn-an/surveill/nutrition/commun/insecurit/hfssm-mesam-eng.php.

- "food-secure"—includes both those who have no or only one indication of difficulty accessing food due to inadequate income;
- "moderately food-insecure"—includes those who indicate that the quality or quantity of their food has been compromised; and
- "severely food-insecure"—includes those who have reduced their food intake and/or disrupted their eating patterns (4).

Due to small numbers resulting from the level of disaggregation used in this report, moderate and severe household food insecurity were combined for this analysis, creating a dichotomous variable. Therefore, this chapter defines people as having household food insecurity if they reported in the CCHS that they live in a household with moderate or severe food insecurity.

With the exception of age stratification, the analysis of household food insecurity included people aged 18 years and over. Prevalence data were age-standardized using the 2011 Canadian Census of Population. Inequalities in the prevalence of household food insecurity were assessed by examining differences according to social stratifiers grouped under socioeconomic and sociodemographic stratifiers collected through the CCHS. Sociodemographic stratifiers include age (12+ years), sex/gender, Indigenous identity, cultural/racial background, immigrant status, sexual orientation (18–59 years)[52], functional health, and rural/urban residence. Socioeconomic stratifiers include income, education (highest household education, 20+ years), occupation, and employment status (18–75 years).

For the Indigenous identity stratifier, the CCHS sampling frame captures information on Indigenous people who identify as Inuit, Métis, or First Nations living off reserve, but excludes First Nations peoples living on reserve and Inuit in the Quebec region of Nunavik. For information on food insecurity among First Nations people living on reserve and in northern communities, see Box 1.

> Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported along with the corresponding 95% confidence intervals (CIs). Statistical significance was assessed using 95% CIs (12). Sex/gender-specific inequalities for all of the social stratifiers were also calculated but reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable fraction, population attributable rate, and population impact number.

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52. The CCHS does not collect data on sexual orientation from individuals over the age of 59 years.

BOX 1

FOOD SECURITY DATA FOR FIRST NATIONS PEOPLE LIVING ON RESERVE AND IN NORTHERN COMMUNITIES

Prepared by the First Nations Information Governance Centre

Information on food security among First Nations people living on reserve and in northern communities is collected by the First Nations Information Governance Centre (FNIGC) and its regional partners through the First Nations Regional Health Survey (RHS). The RHS asks 9 (6 adult items, 3 child items) of the 18 questions asked in the CCHS. In the RHS, it is possible for more than 1 person in a household to respond to the survey, since the sampling frame is based on the band list at the individual level. This differs from the household-level sampling frame of the CCHS. Because of these differences between the RHS and the CCHS in the food insecurity indicator, comparisons were made instead with the Aboriginal Peoples Survey 2012 (APS). The APS asks 6 adult item questions on the food security scale that are similar to those of the CCHS. In addition, the sampling unit is at the individual level, making it better suited for comparing prevalence.

For this report, the indicator from the RHS was calculated using a similar methodology to that used by Statistics Canada for the APS (13), using only the 6 adult questions and 2 categories: food secure (scores of 0–1) and food insecure (2–6). Respondents who answered "don't know" or refused to answer any of the 6 food security questions were coded as "not stated" and excluded from this analysis. Prevalence is not age-standardized, and the indicator can only be compared across Indigenous groups. Lastly, APS results include those 15 and older, whereas RHS results include those 18 and older.

Based on data from the 2008–2010 RHS, 38.3% of First Nations adults living on reserve and in northern communities lived in a food-insecure household. In the 2012 APS, 20% of Indigenous people (excluding First Nations on reserve and in northern communities) aged 15 and over lived in a household that experienced food insecurity in the previous 12 months (13).

Looking specifically at Indigenous women, the prevalence of living in a food-insecure household was 40.6% for First Nations women living on reserve and in northern communities, 23% for First Nations women off reserve, 18% for Métis women, and 43% for Inuit women (14).

This report provides a baseline for the ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified by policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in Canada. (For more detailed information, see the Methodology chapter.)

FINDINGS

Between 2009 and 2012, 7.2% (95% CI: 7.0–7.4%) of Canadians aged 18 years and over lived in households that reported moderate or severe household food insecurity. Most social stratifiers showed significant inequalities in household food insecurity. This report highlights those absolute and relative inequalities in food insecurity among various population groups (social stratifiers) that were most pronounced. (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Age

The prevalence of household food insecurity decreased with age, with seniors experiencing the lowest prevalence of household food insecurity of any age group. Among those aged 65–79 years, the prevalence was 3.0% (95% CI: 2.7–3.3%); among those 80 years and older, the prevalence was 1.7% (95% CI: 1.3–2.2%). Children aged 12–17 years experienced the highest prevalence of household food insecurity, at 10.2% (95% CI: 9.6–10.9%), compared with adults aged 18 years and over, at 7.2% (95% CI: 7.0–7.4%) (Figure 1).

Sex/Gender

The prevalence of food insecurity among women (8.1%; 95% CI: 7.8–8.4%) was 1.3 (95% CI: 1.2–1.4) times the prevalence among men (6.3%; 95% CI: 6.0–6.6%) (Annex 1).

Indigenous Peoples

Prevalence of household food insecurity was higher among Inuit, Métis, and First Nations people living off reserve than among non-Indigenous people. At 24.8% (95% CI: 19.8–29.7%), the prevalence of household food insecurity was particularly high among Inuit adults—3.7 (95% CI: 2.9–4.4) times the prevalence among non-Indigenous adults. Prevalence of household food insecurity among First Nations adults living off reserve was 18.3% (95% CI: 16.5–20.10%), which was 2.7 (95% CI: 2.4–3.0) times the prevalence among non-Indigenous adults (Figure 2). Among Métis adults, the prevalence of household food insecurity was 2.2 (95% CI: 1.9–2.5) times that of non-Indigenous adults. For information on food insecurity among First Nations people living on reserve and in northern communities, see Box 1.

If Inuit adults had the same prevalence of household food insecurity as non-Indigenous adults, there would be a 72.6% (95% CI: 67.3–78.0%) reduction in prevalence among Inuit adults. This means there would be 5 200 (95% CI: 3 840–6 560) fewer Inuit adults with household food insecurity.

Likewise, if First Nations adults living off reserve had the same prevalence of household food insecurity as non-Indigenous adults, there would be a 63.0% (95% CI: 59.2–66.7%) reduction in this prevalence among First Nations people living off reserve. This means there would be 48 120 (95% CI: 40 400–55 830) fewer First Nations adults living off reserve with household food insecurity.

FIGURE 1

Household Food Insecurity by Age Groups, Canada, 2009–2012

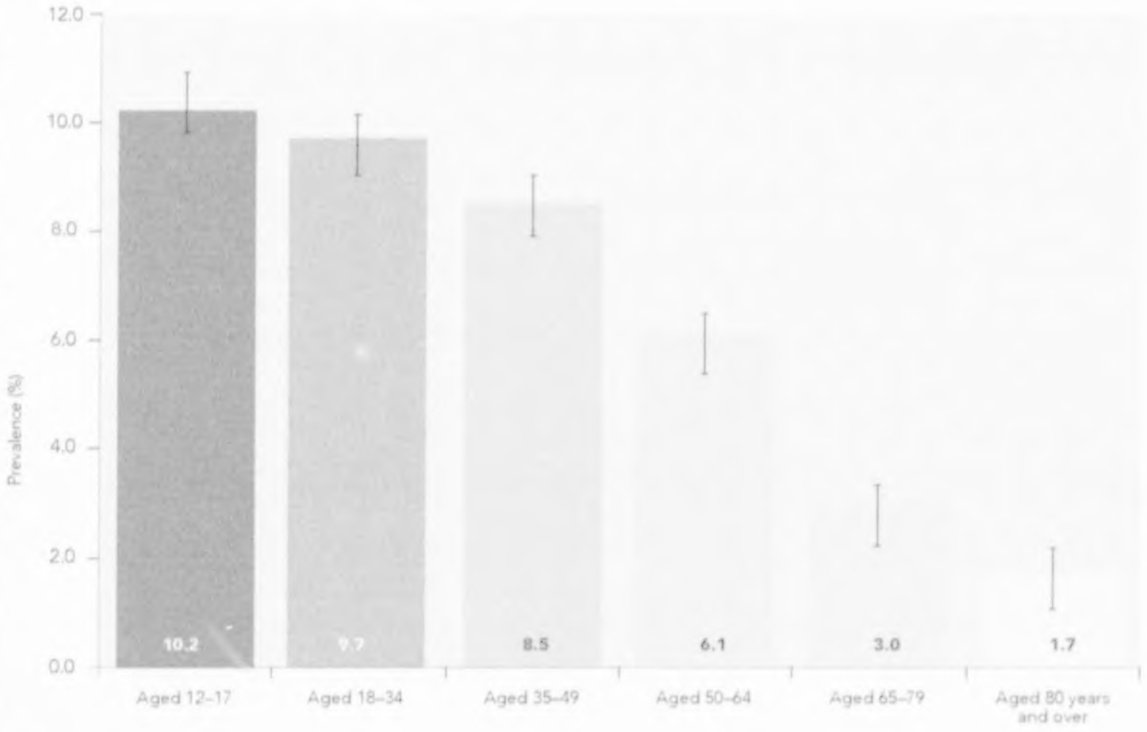
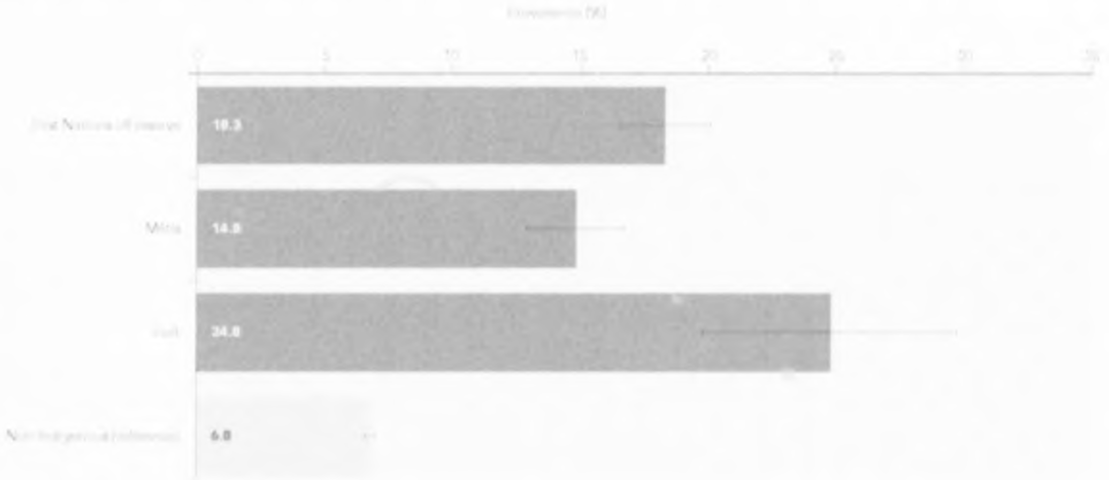


FIGURE 2

Household Food Insecurity by Indigenous Identity, Canada, ages 18+ years, 2009–2012



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
First Nations off reserve	2.7*	11.5*	63.0*	2.5*	0.2*	48 120*
Métis	2.2*	8.0*	54.1*	1.6*	0.1*	29 780*
Inuit	3.7*	18.0*	72.6*	0.3*	0.0*	5 200*
Non-Indigenous (reference)	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2009–2012

Cultural/Racial Background

Inequalities were observed by cultural/racial background. The prevalence of household food insecurity among Black adults was 2.8 (95% CI: 2.4–3.1) times the prevalence among White adults (Figure 3).

If household food insecurity prevalence among Black adults was the same as among White adults, there would be a 63.6% (95% CI: 58.5–68.9%) reduction in prevalence among Black adults. This represents 66 790 (95% CI 51 710–81 870) fewer Black adults reporting household food insecurity.

While inequalities also existed among adults who identified as Arab/West Asian, Latin American, or of multiple origins, there were no inequalities in household food insecurity among South and East/Southeast Asian adults.

Sexual Orientation (ages 18–59 years)

The prevalence of household food insecurity among adults who identified as bisexual was 2.9 (95% CI: 2.4–3.3) times the prevalence of those who identified as heterosexual. No inequality was observed for adults who identified as lesbian or gay (Figure 4).

Functional Health

A clear gradient was observed between household food insecurity and mild to severe functional health impairments. The prevalence of household food insecurity among people with a severe impairment was 5.1 (95% CI: 4.4–5.8) times the prevalence of those with no impairment (Figure 5).

If the prevalence of household food insecurity among those with a severe impairment was the same as among those with no impairment, there would be an 80.3% (95% CI: 77.8–82.8%) reduction in this prevalence among those with a severe impairment. In Canada overall, this would result in a 25.8% (95% CI: 23.7–27.9%) decrease in the prevalence of household food insecurity, which would correspond to 480 900 (95% CI: 436 580–525 220) fewer people living in food-insecure households.

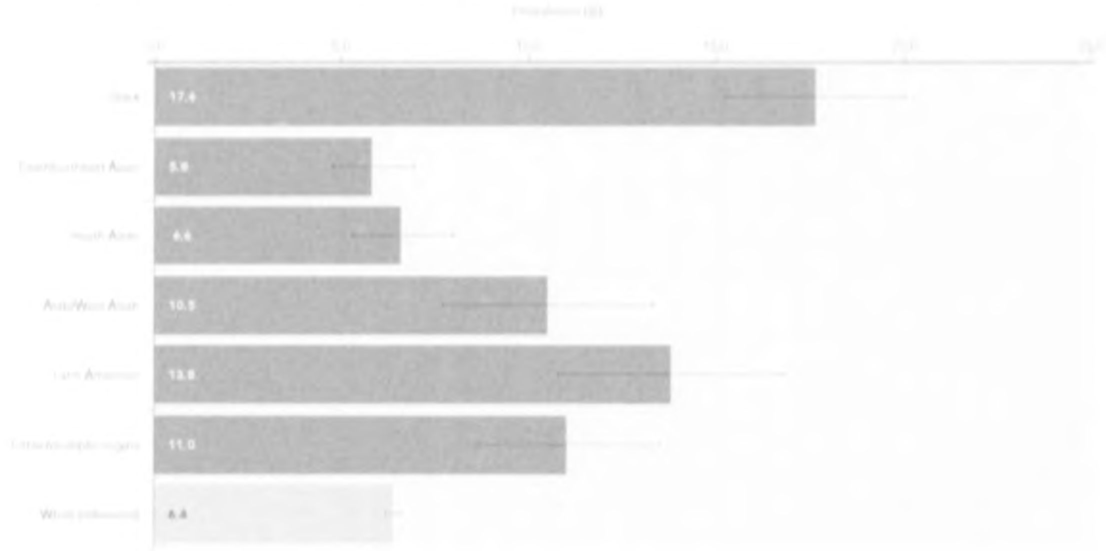
Immigrant Status

The prevalence of household food insecurity among recent immigrant adults (≤10 years in Canada) was 1.5 (95% CI: 1.2–1.7) times the prevalence among non-immigrant adults (Figure 6).

If the prevalence among recent immigrants was the same as that among non-immigrant adults, there would be 62 180 (95% CI: 30 100–94 250) fewer adults living in food-insecure households. No significant difference in household food insecurity prevalence was found between long-term immigrant adults (>10 years in Canada) and non-immigrant adults.

FIGURE 3

Household Food Insecurity by Cultural/Racial Background, Canada, ages 18+ years, 2009–2012

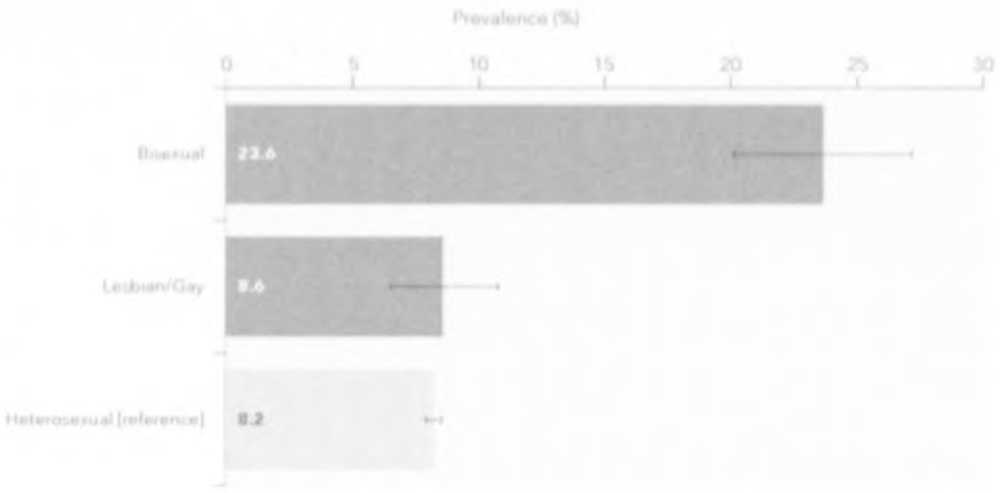


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Black	2.8*	11.2*	63.6*	3.5*	0.3*	66 790*
East/Southeast Asian	0.9	−0.5	NA	NA	NA	NA
South Asian	1.0	0.2	3.8	0.1	0.0	2 480
Arab/West Asian	1.6*	4.1*	39.1*	0.9*	0.1*	17 110*
Latin American	2.2*	7.4*	53.7*	1.3*	0.1*	24 330*
Other/multiple origins	1.7*	4.6*	42.1*	1.1*	0.1*	21 400*
White (reference)	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS): Annual Component 2009–2012

FIGURE 4

Household Food Insecurity by Sexual Orientation, Canada, ages 18+ years, 2009–2010

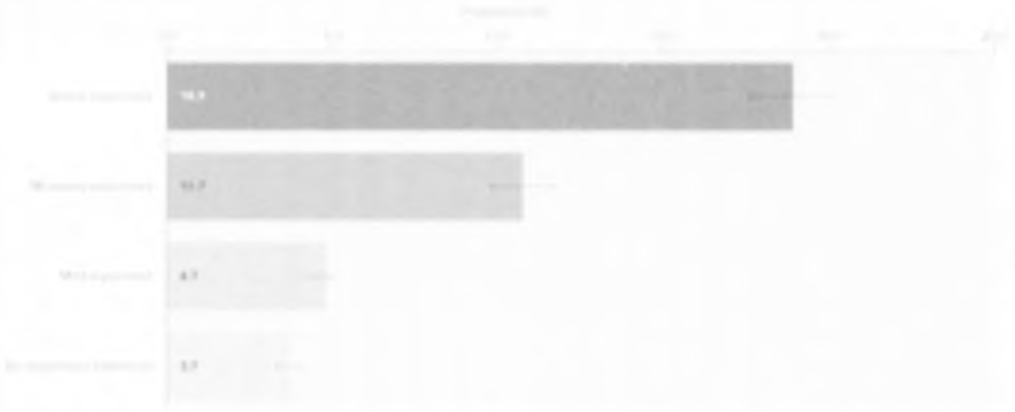


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Bisexual	2.9*	15.4*	65.3*	1.8*	0.2*	31,050*
Lesbian/Gay	1.1	0.4	5.0	0.1	0.0	1,080
Heterosexual [reference]	1.0	0.0	0.0	0.0	0.0	0

*, Significantly different from reference category.
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2009–2010

FIGURE 5

Household Food Insecurity by Functional Health, Canada, ages 18+ years, 2009–2010



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD)	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR)	POPULATION IMPACT NUMBER (PIN)
Severe impairment	5.1*	15.2*	80.3*	25.8*	1.9*	480 900*
Moderate impairment	2.9*	7.0*	65.4*	14.0*	1.0*	260 050*
Mild impairment	1.3*	1.0*	20.5*	6.1*	0.4*	113 580*
No impairment [reference]	1.0	0.0	0.0	0.0	0.0	0

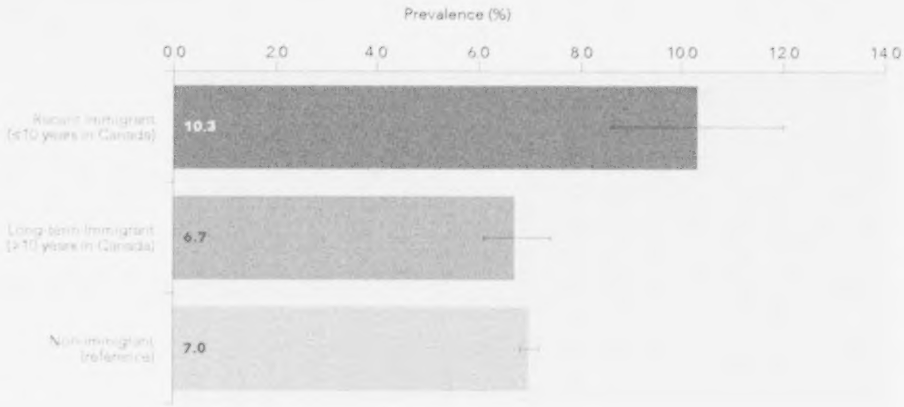
*: Significantly different from reference category

Age standardization was performed using the 2011 Census of Population

Source: Canadian Community Health Survey (CCHS)-Annual Component 2009–2010

FIGURE 6

Household Food Insecurity by Immigrant Status, Canada, ages 18+ years, 2009–2012



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Recent Immigrant (≤10 years in Canada)	1.5*	3.3*	32.1*	3.3*	0.2*	62 180*
Long-term (>10 years in Canada)	1.0	−0.2	NA	NA	NA	NA
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2009–2012

Income

While most adults with severe or moderate food insecurity were in the lowest income quintile, a significant number of food-insecure adults were in the second or third income quintiles. This indicates that not only the most impoverished adults in Canada have experienced household food insecurity. Among adults in the lowest income quintile, 24.0% (95% CI: 23.0–24.9%) lived in severely or moderately food-insecure households. This means that people in the lowest income quintile were more than 30 times more likely to experience household food insecurity (prevalence ratio = 32.4; 95% CI: 25.5–39.4) than those in the highest income quintile. As income increased, household food insecurity decreased, with adults in the highest income quintile having a prevalence of household food insecurity of 0.7% (95% CI: 0.6–0.9%) (Figure 7).

Education (ages 20+ years)

Household food insecurity prevalence was highest among adults with lower levels of education. In households where the highest level of education among adults was less than high school, the prevalence of household food insecurity was 8.5 (95% CI: 7.6–9.5) times that of households with at least one university graduate (Figure 8).

If the prevalence among adults living in households where none of its members had completed high school was the same as that in households with at least one university graduate, there would be an 88.3% (95% CI: 87.0–89.6) reduction in this prevalence among adults living in households where none of its members had completed high school. This corresponds to an 18.7% (95% CI: 17.4–20.0%) decrease in the overall prevalence of household food insecurity in Canada, or 394 300 (95% CI: 363 410–425 180) fewer adults living in food-insecure households.

Compared with households with a university-educated adult, household food insecurity prevalence was greater in households where the highest level of education was high school, some postsecondary education, or community college or technical school. The prevalence ratio (PR) was 3.8 (95% CI: 3.4–4.2) in households where the highest level of education was high school; 4.8 (95% CI: 4.2–5.5) in households with some postsecondary education; and 2.6 (95% CI: 2.3–2.8) in households where the highest level obtained was community college or technical school.

Employment Status and Occupation

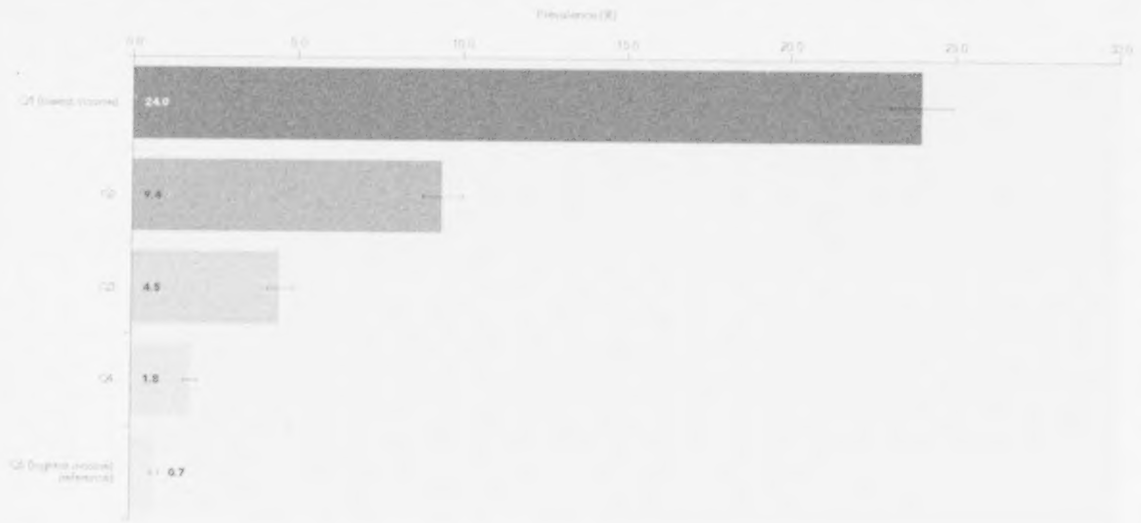
Inequalities in household food insecurity by employment were substantial, particularly among adults permanently unable to work. Among this group, the prevalence of household food insecurity was 5.9 (95% CI: 5.3–6.5) times the prevalence among employed adults (Figure 9).

If the prevalence among adults permanently unable to work was the same as that among employed adults, there would be an 83.1% (95% CI: 81.4–84.7%) reduction in the prevalence of household food insecurity among those permanently unable to work. This would result in 186 490 (95% CI: 150 820–222 150) fewer cases of adults reporting household food insecurity in Canada.

While employment can provide the necessary resources to avoid food insecurity, working households still report food insecurity issues. Among employed adults, those working in unskilled occupations had a prevalence of household food insecurity that was 3.8 (95% CI: 3.0–4.7) times higher than those working in professional occupations. Among adults in semiskilled occupations, prevalence of household food insecurity was 2.6 (95% CI: 2.0–3.1) times higher than among adults in professional occupations.

FIGURE 7

Household Food Insecurity by Income Quintile, Canada, ages 18+ years, 2009–2012

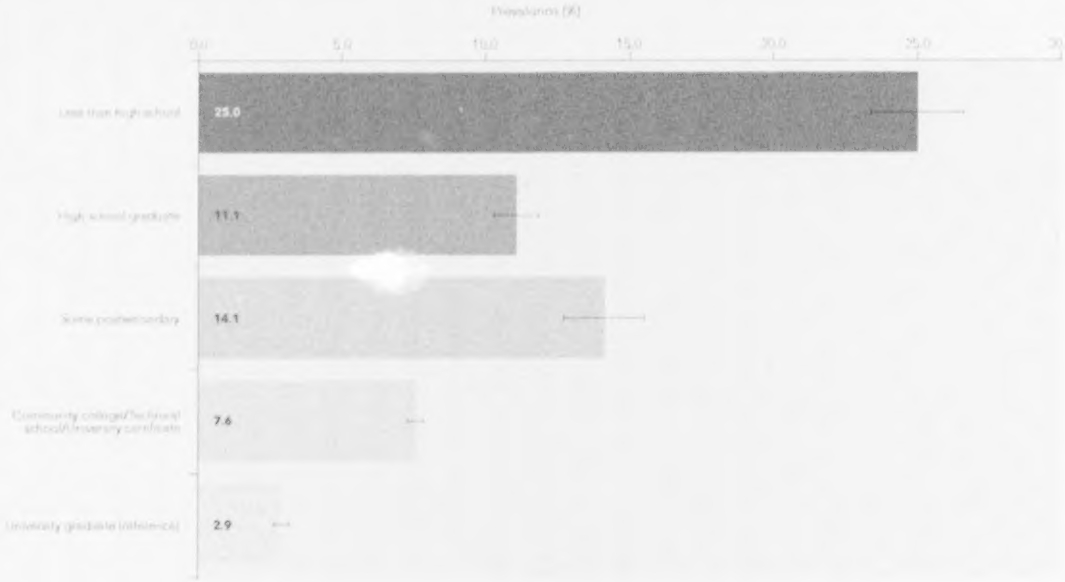


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Q1 (lowest income)	32.4*	23.2*	96.9*	53.6*	4.1*	1 085 590*
Q2	12.8*	8.7*	92.2*	20.8*	1.6*	422 170*
Q3	6.1*	3.8*	83.6*	9.2*	0.7*	186 070*
Q4	2.4*	1.0*	58.0*	2.5*	0.2*	51 430*
Q5 (highest income) [reference]	1.0	0.0	0.0	0.0	0.0	0

Q: Quintile
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2009–2012

FIGURE 8

Household Food Insecurity by Household Education Level, Canada, ages 18+ years, 2009–2012

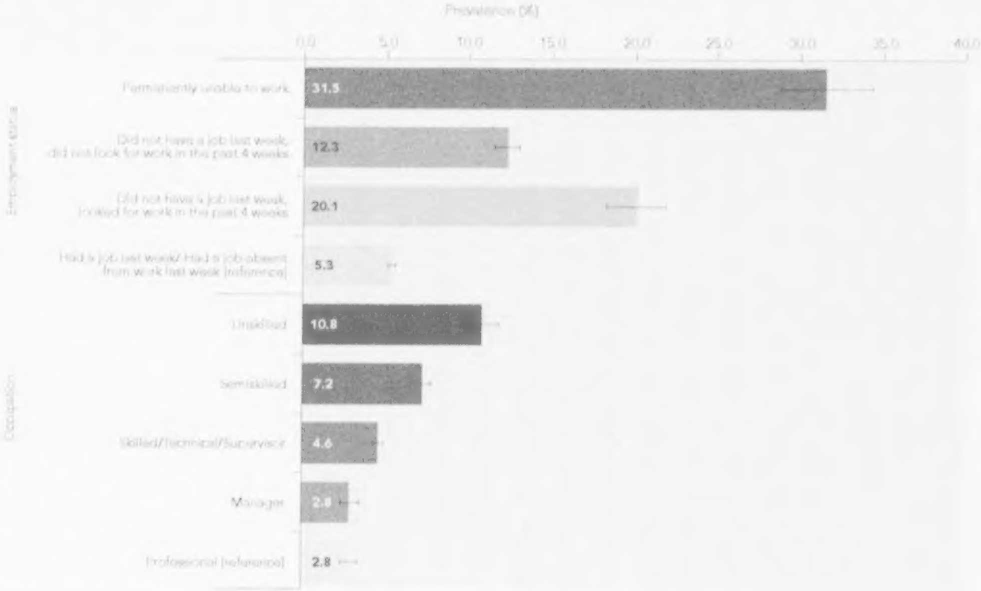


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Less than high school	8.5*	22.1*	88.3*	18.7*	1.5*	394 300*
High school graduate	3.8*	8.2*	73.6*	10.5*	0.8*	221 730*
Some postsecondary	4.8*	11.2*	79.3*	6.4*	0.5*	134 500*
Community college/ Technical school/ University certificate	2.6*	4.7*	61.6*	23.2*	1.8*	488 960*
University graduate [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2009 –2012

FIGURE 9

Household Food Insecurity by Employment and Occupation, Canada, ages 18–75 years, 2009–2012



EMPLOYMENT	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Permanently unable to work	5.9*	26.2*	83.1*	8.9*	0.7*	186 490*
No job last week, did not look for work in past 4 weeks	2.3*	6.9*	56.5*	18.9*	1.6*	394 590*
No job last week, looked for work in past 4 weeks	3.8*	14.8*	73.4*	8.1*	0.7*	169 570*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0
OCCUPATION						
Unskilled	3.8*	8.0*	73.9*	7.4*	0.6*	140 940*
Semiskilled	2.6*	4.4*	61.0*	10.9*	0.9*	208 130*
Skilled/Technical/ Supervisor	1.6*	1.8*	38.6*	5.7*	0.4*	109 360*
Manager	1.0	0.0	NA	NA	NA	NA
Professional [reference]	1.0	0.0	0.0	0.0	0.0	0

NA: Non-applicable
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: Canadian Community Health Survey (CCHS)–Annual Component 2009–2012

If the prevalence among adults in unskilled occupations was the same as that in people in professional occupations, there would be 140 940 (95% CI: 120 580–161 310) fewer cases of adults reporting household food insecurity in Canada. In addition, if the prevalence among adults in semiskilled occupations was the same as that for people in professional occupations, there would be 208 130 (95% CI: 173 580–242 680) fewer cases of adults reporting household food insecurity in Canada.

Rural/Urban Residence

Prevalence of household food insecurity is similar across rural/urban residence[53]. People living in small urban centres have a slightly higher prevalence of household food insecurity, at 1.2 (95% CI: 1.1–1.3) times that of people in large urban centres (excluding Toronto, Montréal, and Vancouver). However, people in remote or rural areas have either similar or slightly lower prevalence of household food insecurity than the reference group.

DATA GAPS/LIMITATIONS

The measurement of household food insecurity was based on the Household Food Security Survey Module, which captures income-related issues of food access at the household level. Food security issues not related to affordability, such as physical and social access to healthy, safe, and nutritious food, are not captured as part of this measure. Due to small numbers resulting from the level of disaggregation used in this report, the values for moderate and severe household food insecurity were combined for this analysis. Although the creation of such a dichotomous variable is not uncommon in food insecurity studies, combining moderate with severe household food insecurity will result in being able to observe more modest associations as severe food insecurity has a far greater impact than moderate food insecurity on an individual's health and well-being (11,13,14).

While CCHS data on food insecurity are collected at the household level, rather than at the individual level, the unit of analysis was individual adults living in food-secure or food-insecure households. This was necessary for assessing inequalities by sociodemographic and socioeconomic stratifiers. While analyses of household-level factors such as homeownership, number of children in the household, and family structure can be used to better understand key inequalities related to food security (6,15,16), they were beyond the scope of this report.

Since the 6-item module of the US Household Food Security Survey that was used in the RHS analysis does not include questions about children's food security, the most severe range of adult food insecurity, in which children's food intake is likely reduced, is not captured here (17).

Income is an important variable, but adjustments were not made for regional variations in cost of living; this was a limitation. Furthermore, beginning with the 2011 CCHS, the household income variable was imputed for missing data, which was the case for 30–35% of all CCHS respondents (18).

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (12), calculating *p*-values would confirm statistically significant differences.

Given that the presented data are cross-sectional, inferring causality is not possible. For example, household food insecurity prevalence was higher among those with severe functional health impairment. While this may be because those with severe functional health impairment were at an increased risk of having food insecurity, it may also be that those with food insecurity are more at risk for functional health impairment. The current analysis was meant to capture the depth and impact of inequalities in household food insecurity prevalence on different socially stratified groups at a given point in time.

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[53] For definitions of rural/urban subgroups, see the Methodology chapter.

These results do not capture the heterogeneous nature of some social groups. For example, comparing the immigrant population as a whole to the non-immigrant population does not capture the nuances of inequality within and between different immigrant populations and can lead to an over- or underestimation of the health burden these groups face (19). Furthermore, information regarding refugee status was absent. As well, the use of a combined cultural and racial background grouping can also lead to an over- or underestimation of prevalence due to grouping heterogeneous groups under a single social categorization (20). In addition, the inequalities facing individuals and communities who hold multiple and intersecting social identities were not captured here.

DISCUSSION

Household food insecurity is strongly linked to the health and well-being of families and individuals—even in higher-income countries such as Canada. Inequalities in household food insecurity are evident across a range of social stratifications, including sex/gender, age, education, income, employment, occupation, functional health, Indigenous identity, and sexual orientation.

Despite a relatively modest inequality measure by sex/gender, sex/gender is strongly related to food insecurity when household structure is taken into account. Households led by female lone-parents are especially vulnerable to food insecurity (6,15,16). Interestingly, in married/cohabiting households with or without children, women reported higher food insecurity rates than men; these differences were not accounted for by either respondent characteristics or socioeconomic factors (21).

Household food insecurity was inversely related to age. The reduced risk to seniors may be due to the protective effect of the guaranteed annual incomes provided to Canadians over 65 years of age (22) and to an increased likelihood of homeownership (23), which is associated with a reduced prevalence of food insecurity (24). The higher prevalence of household food insecurity among children likely reflects the greater risk of food insecurity in households with children than in households with no children. In addition, the prevalence of food insecurity among children aged 12–17 years is likely underestimated given that in such households, adults will often reduce their own food intake even further in order to provide more food to their children (6).

The relationships between household food insecurity and education, income, and employment status follow a clear and pronounced gradient. For example, advanced educational attainment provides more opportunity to obtain higher-paying positions as well as greater employment security, both of which allow for improved access to nutritious food (5).

Low income has consistently been associated with food insecurity in Canada and other developed countries (25,26). In 2014, about 1.9 million Canadian families—close to 1 in 10 people—lacked adequate income to meet their basic needs, and this number has changed little over the last decade (27). Moreover, income inequality has increased over the last 20 years (28). Low income predisposes households to material deprivation, including the inability to afford adequate, nutritious food (5). When the cost of household necessities exceeds a household's ability to cover these expenses, low-income households may be unable to provide sufficient quantity or quality of food (29).

However, food insecurity was not limited to Canadian households with the lowest income. A pooled analysis of CCHS data for 2005–2010 found that about 15% of food-insecure households were not income-poor (30). Factors associated with food insecurity in middle-income families include an inconsistent income, high housing or child care costs (16), renting, (22), chronic diseases, the size and makeup of the household, smoking, and a problem with gambling (30).

The prevalence of food insecurity varied across employment sectors and employment status, with adults who were unable to work and those in unskilled occupations more likely to be in food-insecure households. A previous analysis of households reliant upon labour force participation for income found the highest prevalence of household food insecurity among people working in the accommodation/food service and administration sectors and in households where earners were working several jobs or were in positions they reported as being high stress (31). With comparable levels of education, visible minority workers were more likely to report food insecurity than workers of European ethnicity (31).

Because of the strong relationship between income, education, and employment and the ability to afford healthy foods, higher proportions of food insecurity were observed in population groups that are more likely to be socioeconomically disadvantaged. In Canada, higher levels of unemployment and lower incomes have been reported for most non-White adults than for White adults (32), which may contribute to higher prevalence of food insecurity. Even with comparable levels of education, visible minority workers were more likely to report food insecurity than those who were of European ethnicity (31).

As previously noted, a clear gradient was observed between household food insecurity and mild to severe functional health impairments. Determinants of household food insecurity among those with severe functional health impairments include an inability to work, which results in lower incomes and a reliance on government social assistance for income (4). Households that rely on social assistance programs, such as welfare, employment insurance, and workers' compensation, are at increased risk of food insecurity (15,31,33), though government programs that ensure a guaranteed annual income for seniors have been shown to be protective (22).

Indigenous populations have a higher prevalence of household food insecurity than non-Indigenous populations. Inuit and First Nations people living on reserve and in northern communities are most affected. The prevalence of household food insecurity among Inuit adults was 24.8%. The CCHS data for Inuit may under-represent the extent of food insecurity. For example, the Inuit Health Survey in Nunavut, conducted in 2007 and 2008, has found that more than 70% of adult Inuit households experienced food insecurity (34).

Contributing to food insecurity among Indigenous populations are socioeconomic factors, loss of connection to the land through which traditional, nutrient-rich foods were historically obtained, and loss of community sharing and supports for traditional foods (35) (Box 2). Northern regions of Canada have higher rates of food insecurity. Reliance on lengthy airfreight importation of food leaves residents particularly vulnerable to the impact of increasing fuel costs and unpredictable weather. While adaptive capacity is a key characteristic of Inuit subsistence hunting and fishing, increasing costs, climate change, and cultural shifts have led to difficulties in procuring traditional foods (country foods), reducing the supply of nutritious food in some communities (36,37).

Bisexual adults were almost 3 times more likely to live in a food-insecure household than heterosexual adults. Although research that specifically explores prevalence of household food insecurity among bisexual adults is limited, some research has found that a high proportion of bisexual adults in Canada live in poverty (45); this may contribute to the high prevalence of food insecurity in this group. A 2014 study in the United States of America (USA) also found high food insecurity among bisexual adults compared with adults with other sexual orientations (46).

BOX 2

FOCUS ON FIRST NATIONS PEOPLE LIVING ON RESERVE AND IN NORTHERN COMMUNITIES–CONTEXTUALIZING RESULTS FROM THE FIRST NATIONS REGIONAL HEALTH SURVEY (RHS)

Prepared by the First Nations Information Governance Centre (FNIGC)

Colonial policies that displaced First Nations people from their lands and disconnected them from their culture underlie the present-day prevalence of food insecurity in many First Nations communities (35,38,39). Specifically, assaults on the familial and communal structure (e.g. Indian Residential Schools, the Sixties Scoop) prohibited the consumption of traditional foods and prevented cultural practices surrounding food access (e.g. hunting and gathering practices), preparation, and sharing (e.g. cultural ceremonies) (40,41). These assaults also severed the ability of First Nations people to transfer cultural knowledge that would promote quality food consumption for future generations (35,39). Food insecurity is also rooted in the construction of government-controlled reserves that isolate First Nations people and limit their mobility. First Nations people have been prevented from following animal migratory patterns and travelling for trade, activities that would have provided access to quality foods and economic sustenance for communities (38,40). Furthermore, the rich biodiversity of traditional lands has suffered (and continues to suffer) from extensive urbanization and massive resource extraction, which pollutes and degrades the environment. As a result, the density of animal and plant species and the availability of safe food sources and drinking water have diminished (40,42,43). This reality, along with colonial-induced costs and regulations to fishing and hunting practices, has caused a dependency by many First Nations people on Western foods available from grocery stores (35,44). Because of the increased cost of living in remote areas and the north, and thus the heightened cost to import foods (especially quality foods), and because many communities lack opportunities for socioeconomic development, foods that are more affordable and available to First Nations people tend to be those that are processed and limited in nutrients (35,44).

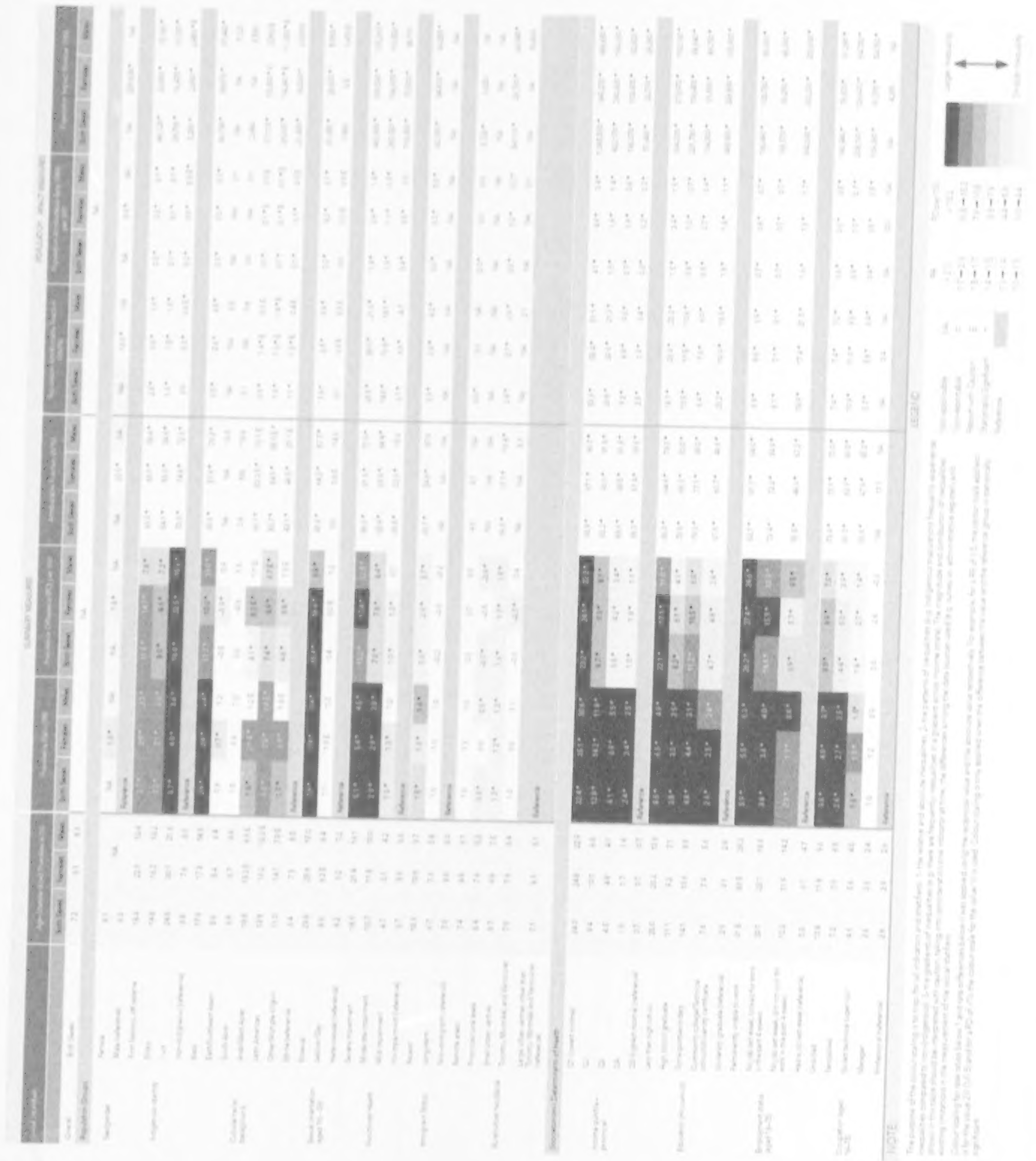
Recent immigrants were 50% more likely to live in a food-insecure household than adults born in Canada; there was no difference in food insecurity between long-term immigrants and adults born in Canada. Evidence regarding food insecurity among immigrants is mixed, with similar elevated rates reported for recent, but not long-term immigrants, in the 2007/2008 CCHS (2). However, other studies have reported a reduced risk for immigrants (15,16,30) after adjusting for factors such as income. Research has suggested that determinants of food insecurity for recent immigrants include unemployment or underemployment after arrival in Canada and corresponding limited income (47). Stress related to having to adapt to a new setting along with difficulties learning or operating in a new language, social exclusion, and loss of community or family supports is also associated with food insecurity among recent immigrants (48,49).

Some countries, including the USA, have federal programs that target food insecurity, but Canada lacks a coordinated approach that specifically addresses this issue. When the United Nations Special Rapporteur on the Right to Food visited Canada in 2012, he was concerned about the high rates and severity of household food insecurity. He specifically outlined the key roles that national strategies play in the promotion and protection of the right to food (50).

In Canada, a growing number of adults are unable to meet their basic food needs (50). This puts them at increased risk of adverse health outcomes, including diabetes (9) and depression (10), as well as an increased reliance on the health care system (11). Many physical and mental health complications, along with this greater reliance, are linked to food insecurity. Inequalities in household food insecurity exist across a range of social stratifiers, including employment status, occupation, immigrant status, racial/cultural background, sexual orientation, and Indigenous identity. For a number of the stratifiers, a social gradient is also evident; as age, household income, household education, and functional health increase, household food insecurity decreases. Household food insecurity is an important social determinant of health, and, while an ideal analysis would examine characteristics at the household level, the current analysis nevertheless documents significant health inequalities among individuals from various socioeconomic and demographic groups. The availability of safe, varied, and affordable food is a core determinant of mental and physical health. This availability is broadly impacted by social and physical environments and contributes to personal and social well-being.

The systematic measurement of health inequalities among Canadian adults living with household food insecurity will help to inform and strengthen existing interventions to reduce the revealed differences and related impacts. However, fully addressing these inequalities will also require policy interventions to impact broader influences including income and poverty reduction, food adequacy, and culturally adapted policies around such issues as traditional foods (50). The ongoing monitoring of health inequalities across sociodemographic and socioeconomic groups will, in turn, inform whether gaps in food insecurity between different socioeconomic groups are widening or narrowing over time and further inform programs, policies and research.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Household Food Insecurity. Data Source: CCHS 2009–2012



References

(1) Ledrou I and Gervais J. Food insecurity [Internet]. Ottawa, ON: Statistics Canada; 2005 Available from: http://www.statcan.gc.ca/pub/82-003-x/2004003/article/7841-eng.pdf.

(2) Health Canada. [Internet]. Health Canada; 2012. Household food insecurity in Canada: Overview [updated 2012 Jul 25; Available from: http://www.hc-sc.gc.ca/fn-an/surveill/nutrition/commun/insecurit/index-eng.php.

(3) PROOF Food Insecurity Policy Research. [Internet]. Food insecurity in Canada [updated 2017 cited 16 November, 2017]; [about 12 screens]. Available from: http://proof.utoronto.ca/food-insecurity/.

(4) Hawkins E and Roshanafshar S. Food insecurity in Canada [Internet]. Ottawa: Statistics Canada; 2015 [cited 17 November, 2017]. Available from: http://www.statcan.gc.ca/pub/82-624-x/2015001/article/14138-eng.pdf.

(5) Mikkonen J, Raphael D. Social determinants of health: The Canadian facts. : York University, School of Health Policy and Management; 2010.

(6) Tarasuk V, Mitchell A and Dachner N. Household food insecurity in Canada, 2014. Toronto, ON: Canadian Institute of health Research; 2016 .

(7) Kirkpatrick SI, Tarasuk V. Food insecurity is associated with nutrient inadequacies among Canadian adults and adolescents. J Nutr. 2008;138(3):604-12.

(8) Kirkpatrick SI, Dodd KW, Parsons R, Ng C, Garriguet D, Tarasuk V. Household food insecurity is a stronger marker of adequacy of nutrient intakes among Canadian compared to American youth and adults. The Journal of Nutrition. 2015 July 01;145(7):1596-603.

(9) Seligman HK, Bindman AB, Vittinghoff E, Kanaya AM, Kushel MB. Food Insecurity is associated with diabetes mellitus: Results from the National Health Examination and Nutrition Examination Survey (NHANES) 1999-2002. Journal of General Internal Medicine. 2007 07/01;22(7):1018-23.

(10) Heflin CM, Siefert K, Williams DR. Food insufficiency and women's mental health: Findings from a 3-year panel of welfare recipients. Social Science & Medicine 2005 November 2005;61(9):1971-1982.

(11) Tarasuk V, Cheng J, de Oliveira C, Dachner N, Gundersen C, Kurdyak P. Association between household food insecurity and annual health care costs. CMAJ. 2015 Oct 6;187(14):E429-36.

(12) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(13) Cook JT, Frank DA, Levenson SM, Neault NB, Heeren TC, Black MM, et al. Child food insecurity increases risks posed by household food insecurity to young children's health. J Nutr. 2006 Apr;136(4):1073-6.

(14) Temple JB. Severe and moderate forms of food insecurity in Australia: are they distinguishable? Aus J Social Iss. 2008;43(4):649-68.

(15) Li N, Dachner N, Tarasuk V. The impact of changes in social policies on household food insecurity in British Columbia, 2005–2012. Preventive Medicine 2016 December 2016;93(Supplement C):151-158.

(16) Sriram U, Tarasuk V. Economic predictors of housefold food insecurity in canadian metropolitan areas. J Hunger Environ Nutr. 2016 Jan;11(1):1-13.

(17) Economic Research Service USDA. [Internet]. U.S. Household Food Security Survey Module: Six-Item Short Form [updated 2012 September, 2012; cited 17 November, 2017]; [about 5 screens]. Available from: https://www.ers.usda.gov/media/8282/short2012.pdf.

(18) Yeung CW, Thomas S, Statistics Canada. Household Survey Methods Division. Income imputation for the Canadian Community Health Survey. 2012.

(19) Chen J, Ng E, Wilkins R. The health of Canada's immigrants in 1994-95. Health rep. 1996 Spring;7 Cat. no. 82-003(4):33-46.

(20) Edwards C, Fillingim R, Keefe F. Race, ethnicity and pain. Pain. 2001 Nov;94(2):133-7.

(21) Matheson J, McIntyre L. Women respondents report higher household food insecurity than do men in similar Canadian households. Public Health Nutr. 2014;17(1):40-8.

(22) McIntyre L, Dutton DJ, Kwok C, Emery JCH. Reduction of food insecurity among low income Canadian seniors as a likely impact of a guaranteed annual income. Canadian Public Policy. 2016 09/01; 2017/11;42(3):274-86.

(23) Hou F. Homeownership over the life course of Canadians: Evidence from Canadian Censuses of Population. Ottawa: Statistics Canada; 2010 [cited 17 November, 2017].

(24) Che J, Chen J. Food Insecurity in Canadian Households [1998/99 data]. Health Reports. 2001 Aug;12(4):17-22 [cited 17 November, 2017].

(25) Pruitt SL, Leonard T, Xuan L, Amory R, Higashi RT, Nguyen OK, et al. Who is food insecure? Implications for targeted recruitment and outreach, National Health and Nutrition Examination Survey, 2005-2010. Preventing Chronic Disease. 2016 10/13;13:E143.

(26) Vozoris N, Tarasuk V. Household food insufficiency is associated with poorer health. J Nutr. 2003 Jan;133(1):120-6.

(27) Statistics Canada. [Internet]. Statistics Canada; Canadian Income Survey, 2014 [updated 2016 July 8, 2016; cited 17 November, 2017]; [about 5 screens]. Available from: http://www.statcan.gc.ca/daily-quotidien/160708/dq160708b-eng.pdf.

(28) The Conference Board of Canada. [Internet]. Canadian income inequality: Is Canada becoming more unequal?[updated 2017 cited 17 November, 2017]; [about 11 screens]. Available from: http://www.conferenceboard.ca/hcp/hot-topics/canInequality.aspx?AspxAutoDetectCookieSupport=1.

(29) Kirkpatrick S, Tarasuk V. The relationship between low income and household food expenditure patterns in Canada. Public Health Nutr. 2003 Sept;6(06):589-97.

(30) Olabiyi OM, McIntyre L. Determinants of food insecurity in higher-income households in Canada. J Hunger Environ Nutr. 2014 Oct;9(4):433-48.

(31) McIntyre L, Bartoo AC, Emery JCH. When working is not enough: Food insecurity in the Canadian labour force. Public Health Nutr. 2014 Jan;17(1):49-57.

(32) Block S and Galabuzi G. Canada's colour coded labour market: the gap for racialized workers. [Internet]. Ottawa, ON: Canadian Centre for Policy Alternatives; 2011 Available from: http://www.wellesleyinstitute.com/wp-content/uploads/2011/03/Colour_Coded_Labour_MarketFINAL.pdf.

(33) Tarasuk V, Mitchell A and Dachner N. Household food insecurity in Canada, 2012. Toronto, ON: Canadian Institute of health Research; 2014 .

(34) Egeland, GM. and the Nunavut Steering Committee Member Organization. International Polar Year Inuit Health Survey: Health in transition and resiliency. Montreal: 2010 [cited 17 November, 2017].

(35) Socha T, Zahaf M, Chambers L, Abraham R, Fiddler T. Food security in a northern First Nations community: An exploratory study on food availability and accessibility. J Aboriginal Health. 2012 March;8(2):5-14.

(36) Beaumier MC, Ford JD. Food insecurity among inuit women exacerbated by socioeconomic stresses and climate change. Can J Public Health. 2010 Jun;101(3):196-201.

(37) Ford JD, Smit B, Wandel J, Allurut M, Shappa K, Ittusasrjuat H, et al. Climate change in the Arctic: current and future vulnerability in two Inuit communities in Canada. Geographical Journal. 2008 Mar;174(1):45-62.

(38) Food Secure Canada. Indigenous Food Sovereignty. Montreal: Food Secure Canada; nd [cited 17 November, 2017].

(39) Power EM. Conceptualizing food security for Aboriginal people in Canada. Canadian Journal of Public Health / Revue Canadienne de Sante'e Publique. 2008;99(2):95-7.

(40) Assembly of First Nations. Traditional foods: Are they safe for First Nations consumption?[Internet]. Ottawa: Assembly of First Nations; 2017 [cited 2017 Sep 29]. Available from: http://www.afn.ca/uploads/files/rp-traditional_foods_safety_paper_final.pdf.

(41) Mosby I, Galloway T. "Hunger was never absent": How residential school diets shaped current patterns of diabetes among Indigenous peoples in Canada. Can Med Assoc J. 2017;189(32):E1043-5.

(42) Human Rights Watch. Make it safe: Canada's obligation to end the First Nations water crisis. 2016 [cited 17 November, 2017].

(43) Takaoka S, Fujino T, Hotta N, Ueda K, Hanada M, Tajiri M, et al. Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada. Science of The Total Environment 2014 15 January 2014;468-469(Supplement C):950-957.

(44) Skinner K, Hanning R, Desjardins E, Tsuji L. Giving voice to food insecurity in a remote indigenous community in subarctic Ontario, Canada: traditional ways, ways to cope, ways forward. BMC Public Health. 2013 May;13:427.

(45) Ross L, O'Gorman L, MacLeod. M, Bauder G, MacKay J, Robinson M. Bisexuality, poverty and mental health: A mixed methods analysis. Soc Sci Med. 2016 May;156:64-72.

(46) Gates G. Food Insecurity and SNAP Participation (Food Stamps) in LGBT Communities [Internet]. The Williams Institute, UCLA School of Law; 2014 Available from: https://brian.carnell.com/wiki/_media/documents:f:food_insecurity_and_snap_participation_in_lgbt_communities.pdf.

(47) Girard A, Sercia P. Immigration and food insecurity: Social and nutritional issues for recent immigrants in Montreal, Canada. International Journal of Migration, Health and Social Care. 2013;9(1):32-45.

(48) Rodriguez P, Dean J, Kirkpatrick S, Berbary L, Scott S. Exploring experience of the food environment among immigrants living in the Region of Waterloo, Ontario. Can J Public Health. 2016;107:eS53-9.

(49) Vahabi M, Damba C. Perceived barriers in accessing food among recent Latin American immigrants in Toronto. Int J Equity Health. 2013 Jan;12(1):1-11.

(50) De Schutter O. Report of the Special Rapporteur on the right of food; Addendum - Mission to Canada. United Nations; 2012 [cited 16 November, 2017].

INEQUALITIES IN
WORKING POOR CANADIANS

INEQUALITIES HIGHLIGHTS

- People who are working poor are defined as individuals between 18 and 64 years who live independently, are not students, and earn at least $3 000 a year with an after-tax family income below the low-income threshold.
- Canadians who had not completed high school are 2.5 times more likely to be among the working poor than Canadians who have graduated from university. This means that there are 6.8 more working poor people per 100.
- Unemployed people who are actively seeking employment have a prevalence of working poverty 2.4 times this prevalence among employed people. This means there are 9.5 more working poor among unemployed individuals who are actively seeking employment per 100.
- The prevalence of working poor among First Nations people is 2.1 times that of non-Indigenous Canadians. This corresponds to 8.4 more working poor people per 100.
- Black Canadians, East/Southeast Asian Canadians, and Arab/South/West Asian Canadians have a prevalence of working poverty 2.2, 1.5, and 1.5 times that of White Canadians. This prevalence corresponds to 8.1, 3.4, and 3.4 more working poor people per 100.
- Canadians who are recent immigrants (living in Canada for ≤10 years) and long-term immigrants (living in Canada for more than 10 years) have a prevalence of working poverty 2.0 and 1.5 times, respectively, that of non-immigrant Canadians. This corresponds to 6.8 and 3.4 more working poor people per 100.
- Sex/gender differences in the prevalence of working poverty are evident by cultural and racial background and by education.

ACRONYM	FULL NAME
CI	Confidence Interval
NHS	National Household Survey

The purpose of this *Pan-Canadian Report on Health Inequalities* is to provide baseline measures of health inequalities in social determinants of health and health outcomes across a range of population groups in Canada. This report identifies and describes the magnitude and distribution of key health inequalities in Canada, as a critical step in facilitating action to advance health equity. It is beyond the scope of this report to describe or assess specific interventions aimed at reducing health inequalities or inequities.

CONTEXT

Working poverty has been studied in many countries to understand how an individual's labour market efforts are associated with their family's poverty status and what the impact of socioeconomic policies and programs is on working poor individuals (1). In developed countries such as Canada, there is a general expectation that those who work hard will be able to provide for themselves and their families. However, some working Canadians struggle to make ends meet. In 2001, approximately 50% of Canadian families living in poverty had at least one person employed, and while their work *effort* was substantial[54], their working conditions, employment security, and social safety net were less favourable than for those with higher family incomes (2). Working poor Canadians were over 3 times less likely to have access to family dental plans, life and disability insurance, or company pension plans compared with Canadians who were working but not poor (1).

There are other sociodemographic characteristics of working poor Canadians. Compared with non-poor working people, they are more likely to earn lower wages, be self-employed, be young (ages 18–24 years), be recent immigrants (≤10 years in Canada), be lone parents, have a disability, and have many children (1). In 2001, about 5.6% of all workers[55] or almost 40% of all Canadians living in low income were in a working poor family (2).

This report defines the working poor as individuals between 18 and 64 years old who live independently, are not students, and earn at least $3 000 a year with an after-tax family income below the low-income threshold (1). This threshold is a relative measure of income, adjusted for household size and calculated at 50% of adjusted after-tax median household income. Based on this definition, in 2014, there were approximately 746 000 Canadians living in a family where the main income earner was considered working poor (3). These people worked similar hours to the average Canadian in the workforce but earned less money and were more likely to be involved in precarious work, have hours that were unpredictable, and hold fewer benefits than workers who were not working poor (1).

METHODS

Data on prevalence of working poverty and stratifier variables were collected through the 2011 National Household Survey (NHS), a self-administered survey conducted by Statistics Canada. The NHS collects information about the demographic, social, and economic characteristics of Canadians and their households. This information is complemented by data provided by the Canadian Census of Population (4).

Inequalities in prevalence of working poverty were assessed by examining differences in working poverty according to social stratifiers grouped under socioeconomic and sociodemographic stratifiers. Sociodemographic stratifiers included age, sex/gender, Indigenous identity, cultural/racial background, immigrant status, and rural/urban residence. Socioeconomic stratifiers included education (20+ years) and employment status (ages 18–75 years).

In the case of the Indigenous identity stratifier, the NHS sampling frame captures information on Indigenous people who identify as Inuit, Métis, and First Nations living both on and off reserve.

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54. In 2001, 76% of low-income workers stated they had 1 500 hours or more of paid work during the year, a percentage that is a little lower than that of workers who were not in a low-income situation in 2001 (88%).

55. Individuals aged 18–64 years who were not full-time students and who cumulated at least 910 hours of paid work in 2001.

Health inequalities refer to differences in health status or in the distribution of health determinants between different population groups. These differences can be due to biological factors, individual choices, or chance. Nevertheless, public health evidence suggests that many differences can be attributed to the unequal distribution of the social and economic factors that influence health (e.g. income, education, employment, social supports) and exposure to societal conditions and environments largely beyond the control of the individuals concerned.

Inequality measures are reported along with their 95% confidence intervals (CI). Statistical significance was assessed using 95% confidence intervals (5). Sex/gender-specific inequalities for all the social stratifiers were also calculated but reported only if the differences between men and women were statistically significant. Six inequality measures were calculated to assess the size and impact of inequalities: prevalence ratio, prevalence difference, attributable fraction, population attributable fraction, population attributable rate, and population impact number.

This report provides a baseline for ongoing monitoring of health inequalities. The systematic measurement of health inequalities can reveal health inequities—the differences in health status between groups resulting from social disadvantages that can be modified through policy and program interventions. The reference group for each subpopulation was selected based on the assumption that this group has the greatest social advantage in Canada. (For more information, see the Methodology chapter.)

FINDINGS

The overall prevalence of working poverty among Canadians between 18 and 64 years old was 7.6% (95% CI: 7.3–7.9%). Inequalities were observed across all sociodemographic and socioeconomic groups, with the exception of sex/gender (Annex 1). (The Health Inequalities Data Tool has information on overall and population-specific sample sizes and the full set of health inequalities results.)

Age

Younger Canadians were more likely to be working poor than their older counterparts. For 18- to 34-year-old Canadians, the prevalence of working poverty was 8.0% (95% CI: 7.8–8.2%); this declined to 5.6% (95% CI: 5.4–5.7%) among those aged 35 to 49 years and to 4.6% (95% CI: 4.5–4.8%) among those aged 50 to 64 years (Annex 1).

Sex/Gender

The prevalence of working poverty was the same for both men and women in Canada, at 7.6% (95% CI: 7.3–7.9%).

Indigenous Peoples

The prevalence of working poverty among First Nations people living on and off reserve was 15.8% (95% CI: 13.8–17.7%). This was 2.1 (95% CI: 1.9–2.4) times the prevalence among non-Indigenous people (7.4%; 95% CI: 7.1–7.6%). Compared with non-Indigenous people, there were 8.4 (95% CI: 6.6–10.2) per 100 more working poor First Nations people (Figure 1).

If the prevalence of working poor among First Nations people was the same as the prevalence among non-Indigenous people, there would be a 53.2% (95% CI: 48.1–58.3%) reduction in prevalence of working poverty among First Nations people. This would reduce the prevalence of working poor in the total population by 2.1% (95% CI: 1.8–2.4%), resulting in 15 254 (95% CI: 12 888–17 620) fewer working poor people in Canada.

The prevalence of working poor among Métis (9.3%; 95% CI: 7.3–11.4%) was not significantly different from the prevalence among non-Indigenous people (Figure 1).

Cultural/Racial Background

In 2011, the prevalence of working poverty among Black Canadians was 14.8% (95% CI: 13.2–16.4%), which was 2.2 (95% CI: 2.0–2.5) times that of White Canadians (Figure 2).

If the prevalence of working poverty among Black Canadians was the same as the prevalence among White Canadians, there would be 8.1 (95% CI: 6.6–9.7) fewer working poor people per 100. This would represent a 55.0% (95% CI: 50.1–59.9%) decrease in prevalence of working poverty among Black Canadians and a 2.1% (95% CI: 1.7–2.4%) decrease in this prevalence in the total population. This would result in 15 085 (95% CI: 12 869–17 300) fewer working poor individuals.

Smaller relative inequalities were observed for other cultural/racial groups. The prevalence of working poverty among East/Southeast Asian Canadians (1.5; 95% CI: 1.2–1.8) and Arab/South/West Asian Canadians (1.5; 95% CI: 1.3–1.7) were 1.5 times that of White Canadians. The inequalities between Arab/South/West Asian men and women and East/Southeast Asian men and women were more pronounced. For example, working poverty prevalence were significantly higher among Arab/South/West Asian men (11.6%; 95% CI: 9.6–13.7%) and East/Southeast Asian men (12.1%; 95% CI: 11.2–13.0%) than among women of the same cultural/racial background (7.2%; 95% CI: 6.3–8.0% and 7.6%; 95% CI: 6.3–8.8%, respectively) (Figure 2).

Immigrant Status

At 13.6% (95% CI: 12.8–14.4%), the prevalence of working poverty among recent immigrant adults (≤10 years in Canada) was 2.0 (95% CI: 1.8–2.1) times that of non-immigrant adults. Similarly, at 10.2% (95% CI: 8.9–11.6%), working poverty prevalence among long-term immigrant adults (>10 years in Canada) was 1.5 (95% CI: 1.2–1.7) times that of non-immigrant adults (Figure 3).

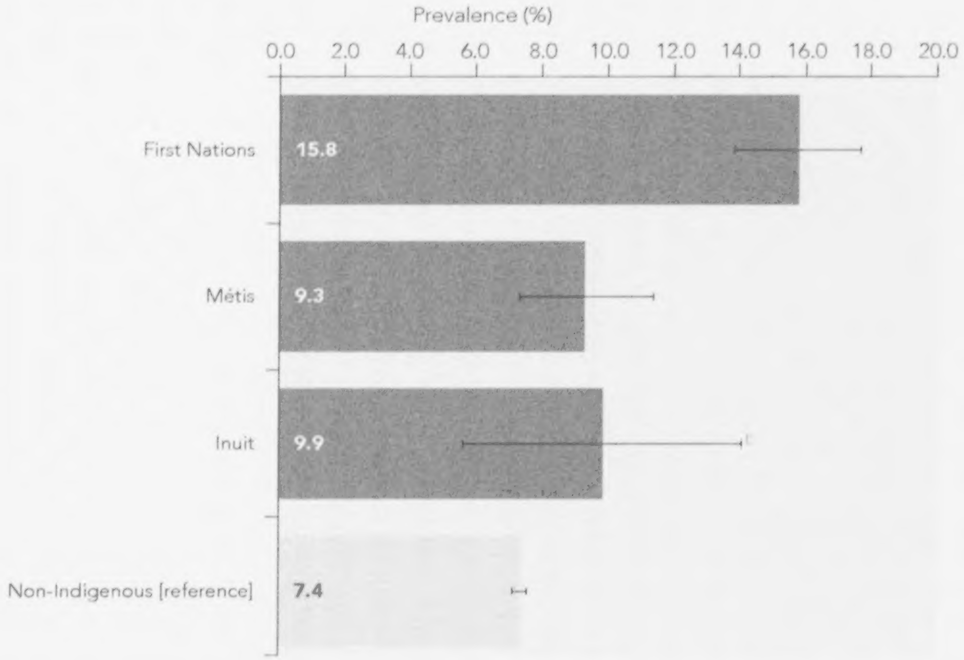
If the prevalence of working poverty among recent immigrant adults and long-term immigrant adults was the same as the prevalence among non-immigrant adults, there would be 6.8 fewer working poor individuals per 100 recent immigrant adults. Similarly, there would be 3.4 fewer working poor individuals per 100 long-term immigrant adults.

If the prevalence of working poverty among recent immigrants was the same as that among non-immigrants, there would be a 49.7% (95% CI: 45.8–53.7%) reduction in working poverty prevalence. This would reduce the prevalence of working poverty in the total population by 6.0% (95% CI: 5.5–6.5%), resulting in 43 523 (95% CI: 39 983–47 063) fewer working poor individuals in Canada. Similarly, if long-term immigrants had the same prevalence of working poverty as non-immigrants, the prevalence among long-term immigrants would be reduced by 33.1% (95% CI: 19.6–46.6%). This would decrease the overall prevalence of working poverty by 5.0% (95% CI: 2.8–7.2%). As a result, there would be 36 482 (95% CI: 20 563–52 400) fewer working poor individuals in Canada.

For both recent and long-term immigrants, the prevalence of working poverty was significantly higher among men than women: 15.7% (95% CI: 14.3–17.0%) for recent immigrants and 12.2% (95% CI: 11.2–13.3%) for long-term immigrants. Among women, the prevalence was 10.8% (95% CI: 9.8–11.9%) for recent immigrants and 8.8% (95% CI: 7.4–10.2%) for long-term immigrants (Figure 3).

FIGURE 1

Working Poor by Indigenous Identity, Canada, ages 18–64 years, 2011

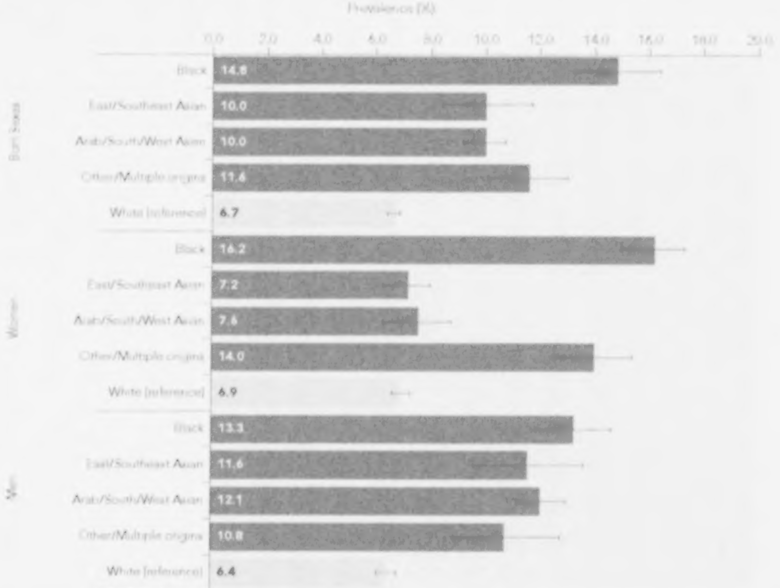


	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
First Nations	2.1*	8.4*	53.2*	2.1*	0.1*	15 254*
Métis	1.3	2.0	21.0*	0.4*	0.0*	2 623*
Inuit	1.3^E	2.5^E	25.2^E	0.0^E	0.0^E	179^E
Non-Indigenous [reference]	1.0	0.0	0.0	0.0	0.0	0

E: Reportable with caution.
*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: National Household Survey (2011)

FIGURE 2

Working Poor by Cultural/Racial Background and Sex/Gender, Canada, ages 18–64 years, 2011

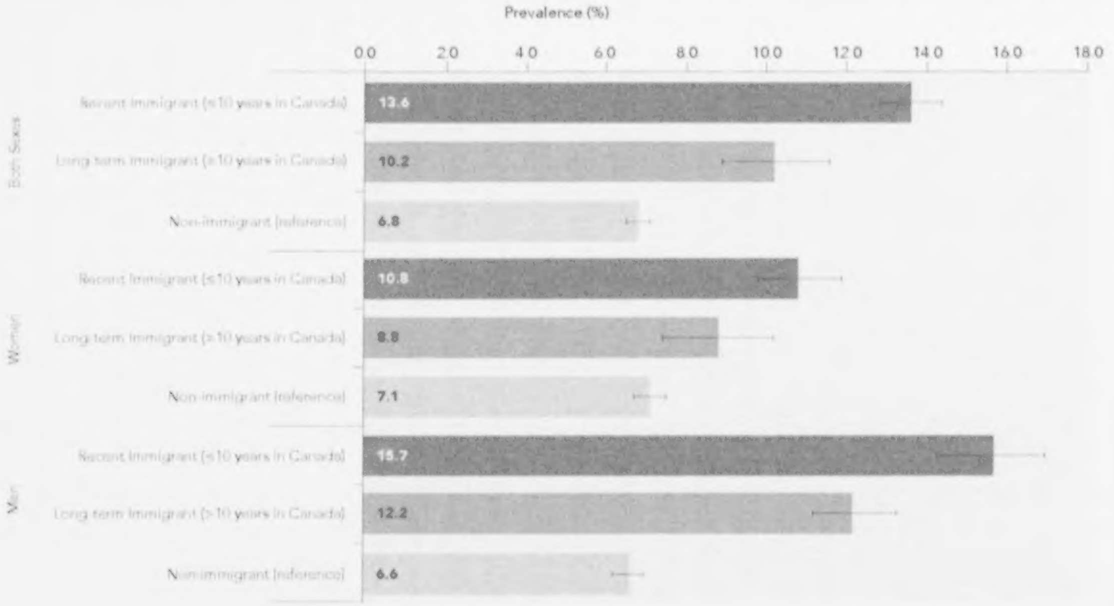


BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Black	2.2*	8.1*	55.0*	2.1*	0.1*	15 085*
East/Southeast Asian	1.5*	3.4*	33.6*	2.8*	0.2*	20 403*
Arab/South/West Asian	1.5*	3.4*	33.6*	2.8*	0.2*	20 692*
Other/Multiple Origins	1.7*	4.9*	42.5*	1.8*	0.1*	13 311*
White [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Black	2.3*	9.2*	57.1*	2.3*	0.1*	8 291*
East/Southeast Asian	1.0	0.2	3.2	0.3	0.0	951
Arab/South/West Asian	1.1	0.6	8.4	0.5	0.0	1 691
Other/Multiple Origins	2.0*	7.1*	50.4*	2.1*	0.1*	7 813*
White [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Black	2.1*	6.9*	51.7*	1.8*	0.1*	6 670*
East/Southeast Asian	1.8*	5.2*	44.9*	3.8*	0.2*	13 810*
Arab/South/West Asian	1.9*	5.7*	47.1*	5.3*	0.3*	19 506*
Other/Multiple Origins	1.7*	4.4*	40.8*	1.8*	0.1*	6 458*
White [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: National Household Survey (2011)

FIGURE 3

Working Poor by Immigrant Status and Sex/Gender, Canada, ages 18–64 years, 2011



BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Recent Immigrant (≤10 years in Canada)	2.0*	6.8*	49.7*	6.0*	0.3*	43 523*
Long-term Immigrant (>10 years in Canada)	1.5*	3.4*	33.1*	5.0*	0.3*	36 482*
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Recent Immigrant (≤10 years in Canada	1.5*	3.7*	34.3*	3.4*	0.2*	12 538*
Long-term Immigrant (>10 years in Canada)	1.2	1.7*	19.6	2.7	0.2	9 829
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Recent Immigrant (≤10 years in Canada)	2.4*	9.1*	57.9*	8.1*	0.5*	29 560*
Long-term Immigrant (>10 years in Canada)	1.9*	5.6*	46.2*	7.6*	0.4*	27 685*
Non-immigrant [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age-standardization was performed using the 2011 Census of Population.
Source: National Household Survey (2011)

Education (ages 20+ years)

There was a clear inverse gradient between education and the prevalence of working poverty, with prevalence decreasing with increasing educational attainment. Among adults with less than high school education, the prevalence was 11.3% (95% CI: 10.8–11.7). This was 2.5 (95% CI: 2.4–2.7) times the prevalence among adults with a university education. This corresponds to 6.8 more working poor adults with less than a high school education per 100 than adults with a university education. If the prevalence of working poverty was the same for adults with less than a high school education as for adults with a university education, there would be a 60.2% (95% CI: 57.7–62.6%) reduction in this prevalence among adults who had not completed high school. This would result in 11.0% (95% CI: 10.4–11.6%) reduction in the overall prevalence of working poverty in Canada, which would equate to 80 022 (95% CI: 74 573–85 471) fewer working poor individuals in Canada (Figure 4).

The gradient in inequality was steeper among women when stratified by education. The prevalence of working poverty among women with less than high school education was 3.1 (95% CI: 2.7–3.5) times this prevalence among women with a university education. Among men, the corresponding prevalence ratio was 2.1 (95% CI: 1.9–2.4) (Figure 4).

Employment Status

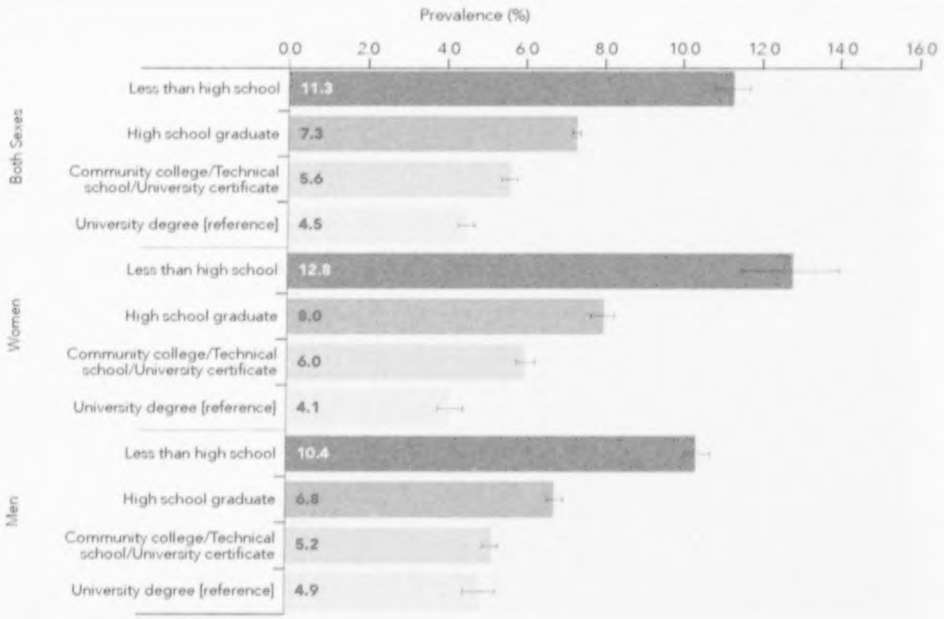
The prevalence of working poverty among those who reported that they had no job last week and had *not* looked for work in the past four weeks was 11.6% (95% CI: 10.9–12.4%). The prevalence of working poverty among those who had no job last week but had looked for work in the past four weeks was 16.3% (95% CI: 14.8–17.7%). In comparison, this prevalence among those who were employed was 6.8% (95% CI: 6.6–7.1%) (Figure 5).

Canadians who were unemployed and were looking for work had a prevalence of working poverty 2.4 (95% CI: 2.2–2.6) times the prevalence among those who were employed.

If the prevalence of working poverty among unemployed Canadians who were looking for work was the same as the prevalence among employed Canadians, there would be 9.5 (95% CI: 8.0–10.9) fewer working poor per 100. This would result in a 58.1% (95% CI: 53.9–62.2%) reduction in the prevalence of working poor among Canadians who were unemployed and looking for work. This would result in a 4.0% (95% CI: 3.4–4.6%) reduction in the overall prevalence of working poverty in Canada and 28 999 (95% CI: 24 556–33 441) fewer working poor individuals.

FIGURE 4

Working Poor by Education Level and Sex/Gender, Canada, ages 20–64 years, 2011

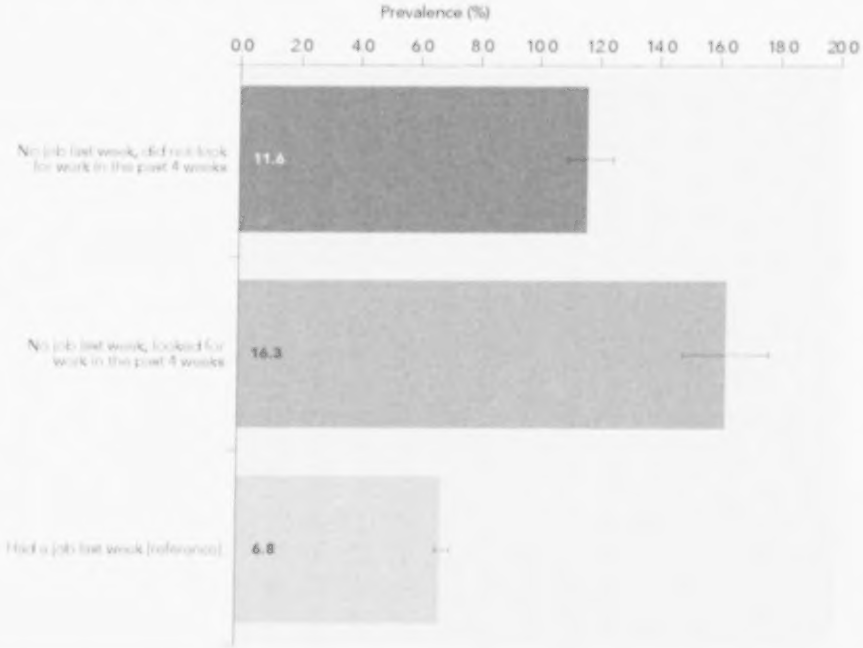


BOTH SEXES	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
Less than high school	2.5*	6.8*	60.2*	11.0*	0.6*	80 022*
High school graduate	1.6*	2.8*	38.4*	10.3*	0.6*	75 440*
Community college/Technical school/University certificate	1.2*	1.1*	19.7*	7.0*	0.4*	51 305*
University degree [reference]	1.0	0.0	0.0	0.0	0.0	0
WOMEN						
Less than high school	3.1*	8.6*	67.7*	10.9*	0.6*	39 501*
High school graduate	1.9*	3.9*	48.4*	13.5*	0.8*	48 993*
Community college/Technical school/University certificate	1.5*	1.9*	31.6*	12.1*	0.7*	43 896*
University degree [reference]	1.0	0.0	0.0	0.0	0.0	0
MEN						
Less than high school	2.1*	5.5*	52.8*	10.8*	0.6*	39 408*
High school graduate	1.4*	1.9*	27.5*	7.2*	0.4*	26 209*
Community college/Technical school/University certificate	1.1	0.3	5.3	1.8	0.1	6 408
University degree [reference]	1.0	0.0	0.0	0.0	0.0	0

*: Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: National Household Survey (2011)

FIGURE 5

Working Poor by Employment Status, Canada, ages 18–64 years, 2011



	PREVALENCE RATIO (PR)	PREVALENCE DIFFERENCE (PD) PER 100	ATTRIBUTABLE FRACTION (AF%)	POPULATION ATTRIBUTABLE FRACTION (PAF%)	POPULATION ATTRIBUTABLE RATE (PAR) PER 100	POPULATION IMPACT NUMBER (PIN)
No job last week, did not look for work in the past 4 weeks	1.7*	4.8*	41.4*	0.7*	0.0*	5 119*
No job last week, looked for work in the past 4 weeks	2.4*	9.5*	58.1*	4.0*	0.2*	28 999*
Had a job last week [reference]	1.0	0.0	0.0	0.0	0.0	0

*:Significantly different from reference category
Age standardization was performed using the 2011 Census of Population.
Source: National Household Survey (2011)

Rural/Urban Residence

Among people living in Canada's largest cities (Toronto, Montréal, and Vancouver[56]) and those living in large urban centres other than Montréal, Toronto, and Vancouver, the prevalence of working poverty was, respectively, 1.1 (95% CI: 1.0–1.2) and 0.8 (95% CI: 0.7–0.8) times that of Canadians living in other parts of the country.

If the prevalence of working poverty among residents of Canada's largest cities was equal to the prevalence among those living in areas other than large metropolitan and urban centres, there would be an 11.8% reduction in the prevalence of working poverty in these three cities. (See information on overall and population-specific sample sizes, and the full set of health inequality results.)

DATA GAPS/LIMITATIONS

The NHS excludes certain subpopulations that may be most affected by working poverty. This includes people living in collective dwellings or institutions as well as migrant workers. These exclusions may lead to an underestimation of the observed unequal distribution of working poverty. Moreover, as the NHS is a self-reported and voluntary survey, the prevalence of working poverty in Canada may be underestimated (6).

The choice of the working poor indicator could affect the size and, potentially, the patterns of reported inequalities. One of the challenges is that there is no standardized indicator to measure working individuals and families who live in poverty in Canada. Definitions often include the number of hours worked over a specific time rather than current employment status. Last (7) defines the working poor as "people who are working for low wages, often in precarious working conditions where they do not earn enough to reach the officially designated poverty level and require assistance, such as subsidized housing and food aid." They also may rely on community or family supports, putting pressure on their social safety nets. The definition used in this report (someone who lives independently, is not a student, is between 18 and 64 years old, and earns at least $3 000 a year with an after-tax family income below the low-income threshold) may not capture a person's standard of living as a relative measure of low income changes with median incomes.

The indicator of working poverty has an inherent connection with inequalities by employment status. While it is possible that Canadians who worked only briefly during the past year and are no longer looking for work may misrepresent the working poor population, it is also possible to capture those who worked during the past year but no longer have that employment and are actively seeking new employment. This group is an example of those who find themselves in occupations of precarious or unstable employment.

Moreover, in Canada, one of the most important determinants of poverty among workers is related to family structure. For example, in 2001, 28% of the working poor were unattached individuals compared to 14% of working non-poor people. Also, 35% of the working poor lived in a household with two adults and three children or more compared with only 11% of their non-poor counterparts. Thus, a major limitation of this analysis is that rates of working poverty could not be stratified by family structure (1). In addition, data on the working poor were not stratified according to other known at-risk subpopulations such as sexual orientation, disability, and occupation.

Although statistical significance of observed health differences can be assumed by comparing 95% confidence intervals (5), calculating *p*-values would confirm statistically significant differences.

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56. For definitions of rural/urban subgroups, see the Methodology chapter.

The data presented are cross-sectional in nature and intended to capture the depth and impact of inequalities in working poverty between different socially stratified groups at one point in time. As the measures used to quantify the inequalities experienced by social groups are defined in an aggregate grouping, these results do not capture the heterogeneous nature of some groups, such as immigrants. The rates among some groups may be over- or underestimated due to these broad groupings (8). Combining cultural and racial backgrounds, thereby assigning a single social categorization to heterogeneous groups, can also lead to an over- or underestimation of the rates (9).

DISCUSSION

Working poor individuals exert a significant amount of work effort and yet often find it difficult to make ends meet. Canada's rate of working poverty was above the Organisation for Economic Co-operation and Development average in 1994, with rates declining from 8.2% to 7.6% in 2011, which was higher than the average relative rate of 5.7% in 24 countries. Canada had one of the highest rates during this period, lower only than the United States (12.1%), Italy (9.7%), and Sweden (8.5%) (10).

Other studies have also shown that the working poor in Canada are over-represented among younger people and under-represented among older people compared with the working-age population as a whole (11). Specifically, Canadians working in poverty are more than twice as likely to be younger than 35 years (2,12,13).

One of the largest relative inequalities in working poverty prevalence was observed by educational attainment. This is consistent with previous research that points to lower prevalence of educational attainment among the working poor compared with non-poor workers. For example, Fleury and Fortin (1) showed that nearly 20% of Canadians who were working poor in 2001 held less than a high school diploma compared with less than 12% of non-poor working Canadians.

High inequalities were also seen among unemployed adults, both those who were and were not actively looking for a job in the past week, compared with those who were employed. However, prevalence of working poverty among those who were employed, while significantly lower than the overall prevalence, was still greater than other subpopulation groups, such as people with a university or community college education. Stable, secure employment can provide individuals with financial security, social status, and personal development; precarious employment can negatively affect health as a social determinant (14). This can include being unable to afford to have a healthy lifestyle (by having, for example, suitable housing or access to safe and nutritious food), but can also extend to the negative psychological impacts of precarious labour situations on mental health (14). Within Canada, an increase in precarious labour in the form of temporary and part-time wage work has resulted in widespread feelings of insecurity due to lower wages, too much work, or too little control over work (15). A global trend of increased employment flexibility has led to greater job insecurity for many individuals: in Canada in 2003, less than two-thirds of Canadians had full-time, permanent employment (16,17). Being employed in a precarious situation can affect the health of workers and their families and can also impact communities by affecting individuals' mental health and/or leading to an inability to afford health services (17).

Both Indigenous peoples and recent immigrants to Canada are most likely to experience persistent poverty in Canada (18). In this analysis, the rate of working poverty among First Nations adults was found to be more than twice that of non-Indigenous people. Although there are no published data on working poverty rates among First Nations people in Canada, previous research shows that, compared with non-poor people, the working poor were twice as likely to be Indigenous people living off reserve (1,19). In addition, employment conditions and the limited labour and employment opportunities for First Nations people living on reserve and in northern communities are affected by a range of contemporary and historical factors, including educational attainment, entrepreneurial opportunities, infrastructure conditions, remoteness of location, access to training, and the intergenerational ripple effects of residential schools (20,21). Foreign-born Canadians, especially recent immigrants, are also more likely to be precariously employed than Canadian-born individuals (22). Fleury (23) found the rates of working poverty among recent immigrants to be almost 2 times that of non-immigrant working Canadians, suggesting challenges in integrating into the Canadian labour market and securing stable employment. Our findings that long-term immigrants had working poverty rates higher than those of non-immigrant Canadians is consistent with research that shows that long-term immigrants continue to experience challenges in integrating into the labour market (23). Other research has found citizenship to be an important mitigating and protective factor against precarious employment, for both recent and long-term immigrants (22).

Inequalities between cultural and racial groups were also apparent with a higher prevalence of working poverty among Black, East/Southeast Asian, and Arab/South/West Asian Canadians compared with White Canadians. While there are no published Canadian studies on prevalence of working poverty among visible minorities, research from the United States of America shows that certain visible minority groups, such as Black and Hispanic Americans, were over-represented among the working poor compared with White Americans. In 2014, according to the US Census Bureau, the prevalence of working poverty among both Blacks and Hispanics was 11.7%, but only 5.5% for Whites and 4.3% for Asians (24). In addition, East/Southeast Asian and Arab/South/West Asian men had a greater magnitude of inequality compared with women in the same population groups.

Among Canadian workers, many struggle to provide for themselves and their families, increasing their risk of a range of chronic conditions and poor mental health (25). An unequal distribution of the working poor exists across a range of socioeconomic and sociodemographic stratifications, including employment status, ethnicity, and Indigenous identity. There is also a clear socioeconomic gradient among the working poor, with rates increasing as household education levels decrease. The inequalities observed among population groups are strongly influenced by social, economic, and physical environments such as safe working conditions, job security, and a social safety net including pensions and benefits. Research and policy interventions on the upstream determinants of working poor status are required to impact the broader environment, including socioeconomic status, working conditions, and family structure supports (1). The systematic and ongoing measurement of inequalities among the working poor, across sociodemographic and socioeconomic groups, is an essential element of strengthening interventions, informing programs, policies, and research, and identifying if and how health inequalities among the working poor are changing over time.

Annex 1. Absolute and Relative Inequalities, and Population Impact Measures for Working Poor. Data Source: NHS 2011

References

(1) Fleury D and Fortin M. When working is not enough to escape poverty: an analysis of Canada's working poor. Ottawa: Human Resources and Development Canada; 2006 .

(2) Fleury Dominique and Fortin Myriam. [Internet]. Ottawa: Social Development Canada; Research Briefs - Canada's working poor [updated n.d. 29 September, 2017; cited 21 November, 2017]; [about 13 screens]. Available from: http://www.horizons.gc.ca/en/content/research-briefs-canada%E2%80%99s-working-poor.

(3) Employment and Social Development Canada. [Internet]. 2016. A backgrounder of poverty in Canada, 2016 Available from: https://www.canada.ca/en/employment-social-development/programs/poverty-reduction/backgrounder.html.

(4) Statistics Canada. [Internet]. Ottawa: Statistics Canada; National Household Survey (NHS) [updated 2011 5 October, 2011; cited 21 November, 2017]; [about 11 screens]. Available from: http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5178.

(5) du Prel JB, Hommel G, Rohrig B, Blettner M. Confidence interval or p-value?: part 4 of a series on evaluation of scientific publications. Dtsch Arztebl Int. 2009 May;106(19):335-9.

(6) Statistics Canada. [Internet]. Statistics Canada; NHS User Guide: National Household Survey, 2011; cited 21 November, 2017]; [about 23 screens]. Available from: http://www12.statcan.gc.ca/nhs-enm/2011/ref/nhs-enm_guide/99-001-x2011001-eng.pdf.

(7) Last JM. A dictionary of public health. New York: Oxford University Press, Inc.; 2007.

(8) Chen J, Ng E, Wilkins R. The health of Canada's immigrants in 1994-95. Health rep. 1996 Spring;7 Cat. no. 82-003(4):33-46.

(9) Edwards C, Fillingim R, Keefe F. Race, ethnicity and pain. Pain. 2001 Nov;94(2):133-7.

(10) Estimates of relative and absolute poverty rates for the working population in developed countries. CSLS Session 'International Perspectives on Poverty and Health'at the annual meeting of the Canadian Economics Association, Montreal, McGill University; 2001.

(11) Stapleton J, Kay J. The working poor in the Toronto region: Mapping working poverty in Canada's richest city. Toronto: Metcalf Foundation; 2015.

(12) Stapleton J, Murphy B, Xing Y. The working poor in the Toronto region. Toronto, Metcalf Foundation. 2012.

(13) Social Planning Council of Ottawa. The working poor of Ottawa. Ottawa: 2005 [cited 21 November, 2017].

(14) Marmot M, Friel S, Bell R, Houweling TA, Taylor S, Commission on Social Determinants of Health. Closing the gap in a generation: health equity through action on the social determinants of health. The lancet. 2008;372(9650):1661-9.

(15) Cranford CJ, Vosko LF, Zukewich N. Precarious employment in the Canadian labour market: A statistical portrait. Just labour. 2003;3.

(16) Vosko LF. Precarious employment: Understanding labour market insecurity in Canada. : McGill-Queen's Press-MQUP; 2006.

(17) Benach J, Vives A, Amable M, Vanroelen C, Tarafa G, Muntaner C. Precarious employment: understanding an emerging social determinant of health. Annu Rev Public Health. 2014;35.

(18) Hatfield Michael. [Internet]. Policy Research Initiative; 2004. Vulnerability to persistent low income [updated 2004 Available from: http://policresearch.gc.ca/v7n2_e.pdf.

(19) Fleury D. Economic performance of off-reserve Aboriginal Canadians: A study of groups at risk of social exclusion. Human Resources Development Canada. 2002 Applied Research Branch working paper series W-02-1E.

(20) Indigenous Services Canada. Creating the conditions for economic success on reserve lands: A report on the experiences of 25 First Nation communities. Government of Canada; 2013 .

(21) The National Aboriginal Economic Development Board. The Aboriginal economic progress report. Quebec: 2015 .

(22) Goldring L, Joly P. Immigration, citizenship and racialization at work: Unpacking employment precarity in southwestern Ontario. Just Labour. 2014;22.

(23) Fleury D. A study of poverty and working poverty among recent immigrants to Canada. Human Resources and and Social Development Canada; 2007 [cited 10 November, 2017].

(24) U.S. Bureau of Labor Statistics. A profile of the working poor, 2014. 2016 BLS Report 1060.

(25) Wilson B. Sick and tired: The compromised health of social assistance recipients and the working poor in Ontario. Toronto: Community Social Planning Council of Toronto, University of Toronto's Social Assistance in the New Economy Project, the Wellesley Institute; 2009 [cited 21 November, 2017].

KEY HEALTH INEQUALITIES IN CANADA:
DISCUSSION AND IMPLICATIONS

ACRONYM	FULL NAME
CPNP	Canada Prenatal Nutrition Program
CSDH	Commission on Social Determinants of Health
EDI	Early Development Instrument
HiAP	Health in All Policies
WHO	World Health Organization

Canadians are among the healthiest people in the world. However, as this report shows, the benefits of good health are not equally enjoyed by all Canadians. Some of these observed inequalities are consistent with what is known from research on the social determinants of health and health equity, whereas others remain to be more fully explored.

This is the first Canadian report to systematically document the extent of health inequalities across a wide spectrum of populations and indicators. In so doing, it provides a benchmark for future action. This is an important first step in the quest for health equity. As mentioned in the Introduction to this report, the findings of the Pan-Canadian Health Inequalities Reporting Initiative can inform, support, and strengthen the development of research, programs, policies, and plans to address health inequities in Canada. These findings can help answer three types of questions:

(1) For a given health issue/determinant of health, what populations face the greatest inequalities?

(2) For which health issue(s)/determinants does a specific population group experience the greatest inequalities?

(3) How can population and public health research, programs, and services better address health inequalities and facilitate health equity integration? For example, by:

  - improving policy, program, and planning decisions;
  - prioritizing science, intervention research, and surveillance investments;
  - supporting program evaluation, including relevance and effectiveness for vulnerable populations; and
  - enabling monitoring of progress in reducing health inequalities.

Key Findings: A Population View

This report notes significant inequalities in many health outcomes and health determinants among socially disadvantaged groups, including Indigenous peoples, sexual and racial minorities, immigrants, and people living with functional limitations. A gradient of inequalities was also observed across levels of income, education, and employment. Some populations, in particular First Nations peoples, Inuit, and Métis people, had consistently less favourable results across daily living conditions, health outcomes, and structural determinants. Other groups experienced mixed outcomes across these domains. For example, heavy drinking was more common among Whites than other racial/cultural groups and more common among those with higher income than those living at lower income (although interestingly, not among those with the most education compared with those with the least). Immigrants had lower risks for many health outcomes and behaviours—important exceptions included tuberculosis, vulnerability in early childhood development, and diabetes.

Men (and boys for the Early Development Instrument; EDI) showed poorer results than women (and girls for the EDI) on most indicators of health-related behaviours and health outcomes (with the exception of asthma, arthritis, poor mental health, and poor oral health). Women showed worse results than men on indicators of structural determinants of health. This is consistent with how structured gender relations that privilege men and disadvantage women (e.g. in the contexts of income, employment, and occupation) are complicated by gender norms and stereotypes that may in some cases disadvantage men (e.g. men are more likely to overwork, which has both positive income effects and negative health effects) (1).

Compared with non-Indigenous people, First Nations, Inuit, and Métis populations experienced inequalities across most health outcome and health determinant indicators. These health inequalities reflect a history of colonialization, forced assimilation, and disrupted relationships with traditional lands that has led to increased poverty, precarious, and underemployment; barriers to social and economic development; and discrimination within housing, education, and health care sectors (2,3). It is also important to note that the use of broad population sub-categories (e.g. "First Nations people living off reserve," "Inuit," and "Métis") is likely to mask significant heterogeneity within Indigenous populations. Similarly, the use of deficit-based indicators in this report does not reflect the concurrent presence of strengths and protective factors within these communities.

For immigrants, results on indicators of both health-related behaviours and health outcomes are generally more positive than for non-immigrants, with short-term immigrants showing better results than long-term immigrants. This is the result of the "healthy immigrant" effect: as people with underlying health issues are often excluded from being able to immigrate to Canada, recent immigrants tend to have better health than non-immigrant Canadians. This effect tends to diminish with time. Important exceptions are diabetes (long term only), early child development, and tuberculosis (risk varies by country of origin). In general, immigrants fared less well than non-immigrants in terms of structural factors—for example, immigrants were much more likely to be working poor and have higher rates of food insecurity and core housing need. Given the relationship between "upstream" (distal) structural determinants of health—how our society is organized—and "downstream" (proximal) health behaviours and health outcomes, failure to ameliorate these structural disadvantages for immigrants is likely to pose problems to this population with time.

Results for populations stratified by racial/cultural background were mixed. Generally, racialized and cultural minority groups showed better results on indicators of health-related behaviours and health outcomes than White Canadians, who had higher prevalence of obesity than all other racial/cultural groups. (Obesity prevalence was particularly low among East/Southeast Asians and South Asians.) Exceptions included diabetes, where Black, South Asian, and Arab/West Asian populations all had prevalence higher than White Canadians, and an inability to chew, where East Asian and South Asian populations both had higher prevalence than White Canadians. However, results for racialized and cultural minority groups were generally worse than White Canadians on indicators of structural determinants of health. Food insecurity was higher among Black, Latin American, and Arab/West Asian Canadians, although not South Asian or East/Southeast Asian Canadians. The prevalence of unmet core housing needs was almost 2 times as high among visible minorities (the category used in some surveys to represent an aggregate of racialized groups) than among White Canadians.

For sexual minority groups (lesbians, gay men, and bisexuals), prevalence for health-related behaviours, health outcomes, and structural determinants was higher among lesbians/gay men than among heterosexuals, and were particularly high for bisexuals. For example, bisexual and gay/lesbian adults were more likely to smoke than those who identified as heterosexual. Similarly, the prevalence of adults reporting poor mental health was 3.1 times as high among bisexuals than among heterosexuals, whereas the prevalence among lesbians/gay men was 1.7 times as high as among heterosexuals. Bisexuals also had worse outcomes on indicators of structural determinants. Compared with heterosexuals, the prevalence of food insecurity among bisexuals was almost 2.9 times as high, whereas there was no statistically significant difference for lesbians/gay men. No data were available for working poor or unmet core housing need because sexual orientation data are not collected on the source surveys for those variables.

In several instances, the results for sexual orientation were mediated by sex/gender. While overall rates of heavy alcohol consumption were comparable among bisexual, gay/lesbian, and heterosexual adults, and there was no increased risk for men who identified as bisexual or gay, the prevalence was higher among bisexual women and lesbians than among heterosexual women. Similarly, while lesbians/gay men were 10% more likely and bisexuals were 40% more likely to report having arthritis than heterosexuals, lesbians had 50% increased prevalence compared with heterosexual women and the risk for gay men was comparable to that for heterosexual men.

For functional health status, data were available for only five of the indicators described in this report. Those reporting a severe impairment were 5 times more likely to report food insecurity. More modest associations (less than 2 times an increase in prevalence) were noted for cigarette smoking, exposure to second-hand smoke, and obesity, whereas no association was observed for heavy alcohol consumption. Because data were cross-sectional, it was not possible to infer cause and effect; therefore, poor functional health may have preceded (and was causally linked to) poorer results for certain health-related behaviours, health outcomes, and structural determinants.

Urban/rural status encapsulates many factors, including the physical environment, population composition (e.g. age distribution; proportion of recent immigrants, who tend to be healthier than Canadian-born residents), and "socioeconomic conditions, occupational activities, culture, customs, community structure and social relationships" (4). "Place" thus represents a complex set of factors associated with specific geographical locations; accordingly, each category of urban/rural status is associated with specific health outcomes, health-related behaviours, and structural determinants of health. Urban areas in Canada, particularly the major cities of Toronto, Montréal, and Vancouver, have higher proportions of immigrants and non-White cultural/racial groups than rural areas, whereas rural populations tend to have a higher proportion of White Canadians and Indigenous peoples. These different compositions are reflected in urban and rural results for indicators of structural determinants, health behaviours, and health outcomes. In general, the major metropolitan areas of Toronto, Montréal, and Vancouver showed more positive results on indicators for health behaviours and conditions (e.g. heavy drinking, smoking, and obesity) than rural areas. On the other hand, presumably because of higher housing costs, Toronto, Montréal, and Vancouver showed higher unmet core housing needs.

Socioeconomic Factors

Socioeconomic factors (income, education, employment, occupational status) underpin many, but not all, of the associations noted. Income is a key factor for structural determinants of health, and in almost all cases, the health inequalities associated with income are paralleled by those for education. Exceptions include obesity and heavy drinking; obesity was prevalent among the most affluent men but also among the least educated men, whereas the most affluent men drink more than the least affluent, but the most educated drink less than the least educated. This has important implications for the development of interventions in these areas. Low income and lack of education were also strongly associated with structural factors such as living in a household with unmet core housing needs and being food insecure. Those employed in a professional capacity (associated with higher status, higher income, and lower risk of injuries) almost always had better outcomes than those engaged in unskilled labour. In a related vein, the unemployed consistently showed worse results than those who reported having a job in the past week; those permanently unemployed fared the worst.

Intersections of Privilege and Disadvantage

Some broadly defined population groups that do not clearly fit the description of "socially disadvantaged"—Whites, men, and those born in Canada—showed some of the most negative results (e.g. high levels of smoking, heavy drinking, and obesity). Because these groupings represent large populations (about half the population is men), these results have a disproportionate impact on the results for Canada as a whole. However, it would be an error to assume that all men engage in the same behaviours, have the same health outcomes, or are exposed to the same structural determinants of health. Not all members of a socially advantaged (or disadvantaged) group will necessarily be advantaged (or disadvantaged) in the same way: "The extent (whether in a single or multiple domains), depth (severity), and duration (e.g. across multiple generations) of disadvantage matter"(5). However, to elucidate how outcomes are correlated with multiple, interlocking systems of privilege and disadvantage (e.g. how health outcomes differ between low-income and high-income men, or between high-income racialized men and low-income White men) requires a different analysis than the one undertaken here.

In most cases, structural factors, behavioural factors, and health outcomes tended to cluster—upstream factors such as low income and education are associated with structural factors such as food insecurity and unmet core housing needs, unhealthy behaviours such as smoking, unhealthy health conditions such as obesity, and adverse health outcomes such as diabetes. These relationships are not necessarily linear—for example, obesity increases the risk of osteoarthritis, which by increasing sedentary behaviour, increases the risk of obesity. Poverty increases the risk of obesity (at least if one is female), but the health effects associated with obesity increase the probability of poverty. However, because the data for this report were cross-sectional, one should not infer causality between variables. The purpose of this report was to describe differences among various population groups with regard to a range of structural factors, daily living conditions and health outcomes (in other words, indicate if and by how much these factors vary for different subpopulation groups).

Key Challenges and Limitations

Reporting on Populations

The ways in which populations were categorized for this report masked potentially high levels of heterogeneity. For example, while there are 634 First Nation communities in Canada representing 50 distinct nations and language groups, their experiences are represented as a single sub-category ("First Nations people living on reserve and in northern communities"). Furthermore, most national surveys do not capture data for First Nations people living on reserve; consequently, summary measures of inequality cannot be calculated for these populations. Although all Indigenous groups have experienced colonization and marginalization, they differ in those experiences according to language, culture, governance, geographic location, potential for resource extraction, and other historical conditions. Likewise, cultural/racial categories were also broadly constructed. For example, Chinese Canadians and Filipino Canadians were lumped together in the category of "East/Southeast Asian," and Black Canadians were put with people of North American, African, and Caribbean heritage in the category of "Black." Cultural norms and structural factors that may influence health-related behaviours and health outcomes are likely to differ between these individual populations as well as between others that were combined into single categories.

Similarly, although this report distinguishes between long-term and recent immigrants, the analysis was unable to differentiate between refugees and other foreign-born Canadians who differ in important ways in pre- and post-immigration experiences, health status, and health determinants (6,7).

In addition, the sub-categories of cultural/racial background used in this report express a range of different concepts, i.e. region of origin, skin colour, and ethnic identity. Sub-categories that are being compared may in fact be reflecting different concepts (e.g. "East/Southeast Asian" is a geographical reference whereas "White" refers to skin colour). Indeed, for some individual sub-categories, it is not clear which of these concepts has primacy (e.g. "Latin American" can be considered a reference to geography, culture, and/or race).

Finally, for many of the social stratifiers of interest, data were not consistently available across data sources. For example, while the Canadian Community Health Survey contains information on a wide variety of social stratifiers, vital statistics such as death certificates do not. This compelled the use of area-based data when looking at many health outcomes, which diminishes the magnitude of observed differences between populations.

Accounting for Multiple Systems of Power and Privilege

Although the data for all stratifiers in this report were also disaggregated by sex/gender, which supports insights into the intersections between sex/gender, this report does not go further in addressing how multiple interlocking systems of power and privilege (e.g. gender, racialization, immigration, socioeconomic status, hierarchies of sexual orientation, and systems of inclusion/exclusion based on physical/mental abilities) are associated with health determinants and outcomes. Moreover, the population groups described in this report might also be understood as a kind of proxy for social systems of stratification. These categories of social identity "correspond to broader cultural and societal constructions of population status by race, ethnicity, gender, religion, ancestry, language, sexual orientation, immigrant documentation status, socioeconomic status, residential neighborhood and other currently or historically salient vectors of social classification" (8). So, for example, the individual attribute of skin colour or gender does not in itself offer systematic health advantages or put one at risk for ill health; rather, social structures of racialization and gender hierarchies afford power and privilege to certain groups defined by those attributes, and disadvantage/limit opportunities of others.

Taking Action on Inequities: Key Principles

Historically, Canada has played an important global and domestic role in advancing analysis of and action on social determinants of health and health equity. From the landmark Lalonde report (9) (*A New Perspective on the Health of Canadians*, 1974), which introduced the concept of "health fields," an early expression of the social determinants of health, to key policy documents such as the Epp Report (10)(*Achieving Health for All:*

A framework for health promotion, 1986), the Ottawa Charter for Health Promotion (1986) (11), *Strategies for Population Health: Investing in the health of Canadians* (1994) (12), and the Rio Political Declaration on the Social Determinants of Health (2011) (13) , Canada has led in highlighting the importance of understanding and intervening on the full range of health determinants (from individual-level behaviours to social conditions) and health inequities.

Conventional approaches to improving population and public health have emphasized improved medical care and individual behaviour change, such as smoking cessation or increasing physical activity. Although important, these approaches often do not address the "causes of the causes" of poor health (14). These upstream factors refer to how our society is organized, including the distribution of power and resources that shape the conditions in which people are born, develop, live, work, and grow old. As these are features of our society, not features of individuals, individual-level interventions are insufficient to alter them (15) . Over the life course, the social and material circumstances that shape individuals' life chances and choices have a profound impact on health and systematically affect subpopulations (defined by social/cultural identity or by socioeconomic position) differently. Most of the differences in health among these subpopulations in Canada are the result of social, political, and economic advantages or disadvantages that these groups experience, which affect their chances of achieving and maintaining good health over their lifetimes. Those health inequalities that can be avoided or ameliorated by societal action can be deemed *inequitable* (5,15-17).

Although some actions to address health inequities are within the purview of health departments, most of the measures that can directly influence social determinants of health flow from the mandates of other government sectors, civil society, and other stakeholders (18) . Nevertheless, public health actors can provide leadership and direction by tackling inequities within their own remit while supporting coordination of efforts across other sectors that have a role in advancing social determinants of health and health equity.

In recent decades, the global evidence on what works to reduce health inequities has grown, making it possible to identify key principles for action and promising practices that can be adapted to advance health equity within Canada (16,19-22).

1. Adopt a human rights approach to action on the social determinants of health and health equity.

This approach recognizes the foundational right to health (embodied in several international treaties) and links this with mobilizing collective resources that enable individual capabilities for health. As noted in the Introduction, the goal of health equity is consistent with fundamental values enshrined in domestic and international laws that acknowledge the equal worth of all human beings and in ethical positions that recognize health as a critical resource for the full enjoyment of and participation in society (17,23,24). The right to health—that is, the right of all individuals to the enjoyment of a variety of facilities, goods, services and conditions necessary for the realization of the highest attainable standard of health—is recognized in several of the principal United Nations covenants and conventions to which Canada is a party, including the International Covenant on Economic, Social and Cultural Rights, the International Convention on the Elimination of All Forms of Racial Discrimination the Convention on the Elimination of All Forms of Discrimination against Women, the Convention on the Rights of the Child, and the Convention on the Rights of Persons with Disabilities (25). Essential to the right to health is the requirement that public health and health care facilities, goods and services, including the social determinants of health, are *available* in sufficient quantity; *accessible* physically, financially, and on the basis of non-discrimination; medically and culturally *acceptable*; and of good scientific and medical *quality* (26). In this view, equitable access to opportunities for health and well-being and their determinants is a matter of fairness and justice.

This approach is supported by intersectoral action based on strong partnerships between public, private, voluntary, and community sectors and whole-of-government/whole-of-society approaches to governance and delivery of health and social policies, programs, and research/evaluation. This includes working with communities most affected by health inequalities to design interventions that are both relevant and effective. Evidence-based, participatory, and coherent action across sectors and levels of government is required to meet the goals of improving the health of populations and health equity.

2. Intervene across the life course with evidence-informed policies and culturally safe health and social services.

Advantages and disadvantages in health and the distribution of its social determinants accumulate over the life course, from pregnancy and early childhood development, through schooling and work environments, to older age (22). These advantages and disadvantages can also accumulate over generations, as the conditions in which a person's parents and grandparents have lived will influence that person's opportunities and outcomes. Addressing systemic inequities in the distribution of power and resources (by addressing material and social deprivation and gender inequities) and ensuring the provision of adequate resources for physical, cognitive, and emotional development (e.g. via maternal health care, parenting supports, and high quality child care and early education) can substantially affect health outcomes and health equity.

The foundations of adult health are first established in utero and in early childhood (27). Evidence-based policy approaches to improve early childhood development focus on educating caregivers about responsive and nurturing environments, supporting maternal health (including mental and nutritional health), and reducing poverty (28). Although some studies of early childhood education programs have found that cognitive effects (generally measured by academic performance and IQ scores) largely disappear within a few years (29), others have shown improvements in social-emotional skills and related long-term academic and social outcomes (e.g. higher rates of high school graduation, reduced teenage pregnancies) as well as significant gains in adult employment, earnings, participation in healthy behaviours, and reduced criminal activity (30-32). For example, the Better Beginnings, Better Futures program, which targets families in low-income communities, has been found to improve long-term social and school functioning among participants in Ontario (33). Moreover, despite the focus of some programs on children in low-income families, there is evidence to support universal delivery: funding effective early childhood development programs provides substantial benefits and a positive return on investment in both low-income and middle-income participants (30).

Some early childhood development programs focus specifically on parents. One such program that has been shown to be effective is the Triple P—Positive Parenting Program, which uses behavioural, cognitive, and developmental principles based on social learning theory to improve parenting skills (34). The Canada Prenatal Nutrition Program (CPNP) targets marginalized pregnant women through initiatives that include education, counselling and support for breastfeeding, food preparation and infant care, as well as provision of vitamins, food and food coupons to improve maternal-infant health. Women with high exposure to the CPNP were more likely to improve their health behaviours and less likely to give birth to a premature or small-for-gestational-age baby (35). Similarly, the Manitoba Healthy Baby Prenatal Benefit provides a modest income supplement to women living at low income during pregnancy; women who received the supplement have shown decreased rates of low birth weight and preterm birth and increased rates of breastfeeding (36).

Relative poverty in childhood has a strong influence on health throughout life. Successful childhood poverty reduction strategies have focused on providing direct benefits with programs that help parents overcome obstacles to getting jobs. Various tax credits, income transfers, and employment programs can contribute to reducing child poverty and its negative health effects (37-39). Nevertheless, child poverty rates remain higher than overall poverty rates for Canadians (40). Because families must file their taxes in order to get these benefits, some jurisdictions are providing tax clinics and other resources to better support low-income people in filing their taxes and claiming eligible benefits.

Education and schooling also play important roles in influencing the life course by fostering both general and health literacy, shaping future employment opportunities, and promoting a greater sense of personal control. Although two-thirds of Canadians have completed at least some postsecondary education, Indigenous and low-income youth are underrepresented (41). Recent research has also found that immigrant youth aged 20–24 years were more likely than longer-term immigrant youth of the same age to leave before completing high school (42).

As noted above, support for early childhood development programs can help vulnerable children achieve better educational outcomes later in life. Many Canadian colleges have signed the Indigenous Education Protocol, which commits them to supporting Indigenous education by, among other things, increasing the number of First Nations instructors and senior administrators in educational institutions and incorporating the intellectual and cultural traditions of First Nations peoples into school curriculum (43). Although most Canadian universities offer services targeted to Indigenous people, such as academic counselling or peer mentorship, and a majority have community outreach programs that target Indigenous youth, far fewer Indigenous people than non-Indigenous Canadians have a university degree (43).

For working-age adults, employment-related policies and interventions can improve health and reduce health inequities. For example, both governments and employers play important roles in preventing occupational injuries (the prevalence of which is higher in unskilled and semi-skilled occupations) through improved training, safety standards, and oversight; improving psychosocial conditions in workplaces; and protecting the employment rights of the most vulnerable, including contract and part-time workers. Legislation is also established to govern minimum wages and help establish benefits for the working poor. In addition to protecting the income of unskilled workers, minimum wage policies influence the level of compensation of other employees by acting as a base which employees or their unions use to negotiate for higher remuneration. However, the value of increasing the minimum wage to fight poverty remains contested, as there is some evidence that increases in minimum wage are associated with higher unemployment rates (44).

In addition, although Canada has one of the lowest rates of elder poverty among the developed countries (45), older Canadians often experience social isolation and discrimination. Older women in particular are at greater risk of poverty and living more years with disability. Efforts to reduce social isolation (especially via interventions that are participatory, group-based, and include social activities and support), improve living conditions (including housing adequacy and pensions), and creating opportunities for physical activity can help address some of these (22,46).

3. Intervene on both proximal (downstream) and distal (upstream) determinants of health and health equity.

Public health actions that have focused solely on individual-level knowledge/skills-based interventions have in some cases inadvertently increased health inequalities. For example, anti-tobacco campaigns have changed smoking from a behaviour common among many Canadians to one concentrated among the marginalized. This is because the better educated and more affluent tend to have greater health literacy and more resources which they can use to act on long-term health risks (47). Recent systematic reviews have revealed "little or no evidence demonstrating the equity impact of [individual, behaviour-focused] interventions in the long term, unless these efforts were accompanied with broader structural changes" (48,49).

Public health efforts that focus on socioeconomic, political, cultural, and environmental factors are more likely to reduce inequalities, but may also be more challenging to implement due to potential political challenges as well as the scale and timeframes required (48). A systematic review by Bambra et al. (50) has suggested that some types of interventions may reduce inequalities or positively affect the health of specific disadvantaged groups, particularly interventions in the housing and the work environments:

In the reviews of work environment interventions—for example (such as changes to the organisation of work and privatisation), there is evidence that the effects of change are experienced differently by different levels of employee and that health outcomes differed accordingly. [...] Similarly, there is suggestive evidence that housing change may positively affect physical and mental health, but the actual effects may be small. (50)

Other upstream interventions that have been successfully implemented without increasing inequalities have been undertaken through regulatory action, such as mandatory seatbelt use (47). Similarly, laws and regulations that increase cigarette taxes have been shown to decrease tobacco use preferentially among those in the lowest-income categories (51). In the United States of America, it has been suggested that the Food and Drug Administration require cigarette manufacturers to reduce the nicotine levels of their products to non-addictive levels (52).

Overall, however, there remain substantial gaps in the evidence base on the effectiveness of broad policies in a range of sectors, including education, health care, and food and agriculture. There is also a paucity of evidence on the influence of macro-level policies on health inequalities, such as "measures to ensure legal and human rights, 'healthier' macroeconomic and labour market policies, the encouragement of cultural values promoting equal opportunities and environmental hazard control (including upholding international obligations and treaties in this field)" (50).

4. Deploy a combination of targeted interventions and universal policies/interventions

The aim of action on social determinants of health and health equity is not simply to remedy those inequalities experienced by the most disadvantaged, but to improve the health of all groups to the levels of health enjoyed by the most advantaged (22). Ensuring that everyone has adequate material and social resources and opportunities to support their health is foundational, and can be accomplished through a combination of universal and targeted interventions (14,53).[57] Policies and program interventions may be specifically geared towards those with the worst health outcomes and greatest social disadvantage; they may also be designed for universal delivery, but are implemented at a level and intensity of action that are proportionate to need—also known as "proportionate universalism" (22).

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57. The late Dr. Patricia J. Martens (1952–2015), former Director of the Manitoba Centre for Health Policy, described this combination as a "shift and squish" approach to population health and health equity. She reminded policy actors and practitioners that if the distribution curve on a graph of population health could be "shifted" towards better health for the population as a whole through universal interventions, overall health gains would be significant, but the gap between the least and most healthy—represented by the "tails" of the curve—would remain the same. The "squish" involves narrowing the gap/distance between the tails through interventions targeted at populations facing the most disadvantage.

Caution must be exercised in implementing targeted interventions. To avoid stigmatizing targeted groups, it is important to consult with those target populations and communities in the development and implementation of policies and programs. Moreover, if there is a gradient in risk within sub-groups of a population (e.g. from low to high income), care must be taken to not overlook those groups that fare better than the least advantaged but less well than the most advantaged (54).

Pairing targeted and universal interventions helps ensure that the targeted intervention effects are not "washed out" by broader conditions that may sustain social inequalities. For example, as described above, early childhood development programs (which often focus on marginalized children and families) have been shown to improve children's social and cognitive development and have a positive effect on social outcomes into adulthood. However, these effects can be "mediated by more far-reaching policies: by employment and fiscal policy and by the public provision of education, housing and social security. These mainstream policies have a more powerful impact on an individual's life chances and living standards and on the scale of inequality in the wider society." (19).

5. Address both material contexts (living, working, and environmental conditions) and sociocultural processes of power, privilege, and exclusion (how social inequalities are maintained across the life course and across generations).

Material deprivation is not the only pathway between social inequalities and inequitable health outcomes; sociocultural processes that maintain privilege and disadvantage and inclusion and exclusion also play an important role. The health effects of material conditions and of one's social identity/location across subpopulation groups (defined by, for example, Indigenous, racial, or cultural heritage; sexual orientation; or immigrant status) are "dynamic and environmentally contingent, rather than biologically or culturally essential, or reducible to behaviors, traits, or material assets" (8). Physiological stress is created by environments that present threats to social identity or safety and by misalignment between the needs and capacities of marginalized groups and the institutions they must navigate in everyday life (8). When these threats and challenges are persistent and substantial, the associated chronic stress can have a "weathering" effect on the bodies of marginalized populations (8).

Accordingly, health equity cannot be achieved through material solutions alone. Although reducing systematic exposure to adverse material conditions (poverty, food insecurity, environmental toxins, overcrowded or derelict housing) and supporting equitable living and working conditions are essential for advancing health and health equity, these actions need to be complemented by efforts to empower disadvantaged communities and tackle harmful processes of marginalization and exclusion (e.g. systemic discrimination and stigmatization) embedded in hierarchies of power and privilege. Action to mediate or remedy exclusion should therefore focus on the *processes of marginalization*, "rather than focusing simply on addressing the characteristics of excluded groups"(22).

There has been limited study of possible interventions to reduce the structural stressors that induce inequitable health outcomes; however, some empirical evidence is emerging about what might help change "the ideological mindsets, relationships, and environments" that trigger physiological stress in marginalized groups (8). Equity-oriented impact assessments can support the identification of both known and unanticipated consequences of policies and program design and delivery on marginalized populations (8,55). Some examples of work that can alleviate exclusion are collaborative gender equity, anti-racism, and broad anti-oppression initiatives (56,57); training in health equity, cultural safety, and trauma- and violence-informed care (36); and intentional and sustained efforts towards reconciliation between Indigenous peoples and governments, religious institutions, and settler Canadians from local to national levels (58).

6. Implement a "Health in All Policies" Approach

Recognizing that many of the policy levers that influence the social determinants of health lie outside of the health sector and as such can only be addressed through collaborative engagement with other sectors, the World Health Organization (WHO) has developed a framework to support jurisdictions in advancing a "Health in All Policies" (HiAP) approach to decision-making. HiAP seeks to systematically take into account the health implications of government decisions in order to better avoid harmful health impacts and improve population health and health equity (18).

HiAP approaches have been implemented in a growing number of jurisdictions. For example, HiAP is institutionalized in the Quebec *Public Health Act*, which requires that all legislative proposals undergo an assessment of their potential health impacts. Internationally, HiAP has been implemented at the national level in Brazil, Finland, Iran, Mexico, and Thailand and at the sub-national level in South Australia and California. An evaluation of the approaches in South Australian found that HiAP "has been successful in developing robust policy processes to bring about action on the determinants of health and has navigated a fast changing and complex policy environment and proved sustainable for over 5 years" (59) with policymakers reporting increased knowledge of health impacts and strengthened cross-government partnerships. Jurisdictions that have had some success in implementing HiAP have identified a number of enabling factors, including senior-level commitments to a shared mandate, clear accountabilities and incentives across government departments, dedicated human and financial resources for HiAP coordination, and enabling institutional mechanisms and tools (60,61). Despite promising early results, however, HiAP remains an emerging practice, and more evaluative research is needed, particularly related to implementation strategies and longer-term health and health equity outcomes (59,62).

7. Carry out ongoing monitoring/ evaluation

Improving population health and health equity requires current, systematic, and robust evidence to inform policy actors, practitioners, community organizations, and citizens about how health and its determinants are distributed across subpopulations, and how policies and interventions affect health and health equity. In its final report, the WHO Commission on Social Determinants of Health (CSDH) argued that "action on the social determinants of health will be more effective if basic data systems, including vital registration and routine monitoring of health inequity and the social determinants of health, are in place and there are mechanisms to ensure that the data are understood and applied to develop more effective interventions" (63). Accordingly, the CSDH urged national governments to create national health equity surveillance systems that routinely collect data across a range of social determinants of health and health outcomes, stratified by geography/region and social groups relevant to each country's context.

A recent WHO review of social determinants of health and health inequalities in Europe reiterated the need for periodic detailed reporting on the magnitude and trends of health inequalities and their determinants(22). The objective of this work is to support surveillance and research activities, inform policy and program decision-making to more effectively reduce health inequalities, enable the monitoring of progress in this area, and facilitate collaborative action across jurisdictions.

The Pan-Canadian Health Inequalities Reporting Initiative has revealed gaps and challenges in health inequalities measurement and monitoring, including deficits in data infrastructure (for some subpopulation groups and determinants of health). There is also a dearth of intervention research to assess which actions may be most effective in improving population health and reducing health inequities, although there have been increased attention to and investments in equity-oriented population health intervention research in Canada over the past decade.

Those who experience inequities in the social determinants of health and health outcomes can provide important knowledge and insights into the development, implementation and evaluation of data infrastructure, surveillance programs, policies, and interventions. These populations should be meaningfully engaged wherever possible. This is particularly true for the measurement and monitoring of and action on health inequalities experienced by First Nations, Inuit, and Métis peoples in Canada.

CONCLUDING REMARKS

The social determinants of health cross social boundaries; healthful living/working conditions and robust infrastructure support the health of all. For example, education systems not only foster individual skills, but also provide high quality workers for industry; labour standards, health and safety regulations, building codes, and other regulations ensure safe working conditions, built environments, and quality products and services for everyone, regardless of social class or identity. Ensuring the equitable distribution of resources that support capacity for health across social groups is a sound investment for everyone.

Much remains to be done to achieve the goal of health equity. "Action is needed on the social determinants of health across the life course, in wider social and economic spheres, and to protect future generations"(22). This action should rest on a strong foundation of human rights (including the right to health); address the full scope of the life course (including transgenerational health inequities); encompass both upstream and downstream interventions; deploy a combination of targeted and universal interventions; address both material contexts (living, working, and environmental conditions) and sociocultural processes of power, privilege, and exclusion; operate at all levels of governance and across sectors and government departments; and include robust systems of monitoring and evaluation. Moreover, action on social determinants of health and health equity can be strengthened through stronger partnerships and integration across science, practice, and policy; and advanced through "transformational, translational, and transdisciplinary research" (20).

Ultimately, achieving the goal of health equity demands that we acknowledge our interdependence—our shared responsibility to create and sustain healthful living and working conditions and environments, and the shared benefits that we can all enjoy when those conditions are in place. Tackling health inequities requires effort, innovation, and ingenuity, but Canadians are up to the task if we apply our collective will and wits in the service of our common good.

References

(1) Cha Y, Weeden KA. Overwork and the slow convergence in the gender gap in wages. Am Sociol Rev. 2014;79(3):457-84.

(2) Loppie S, Reading C and de Leeuw S. Aboriginal experiences with racism and its impacts [Internet]. Prince George: National Collaborating Centre for Aboriginal Health; 2014 [cited 2017 Sep 29]. Available from: https://www.ccnsa-nccah.ca/docs/determinants/FS-AboriginalExperiencesRacismImpacts-Loppie-Reading-deLeeuw-EN.pdf.

(3) National Collaborating Centre for Determinants of Health. Let's talk: Racism and health equity. Antigonish, Nova Scotia: St. Francis Xavier University; 2017 .

(4) Pong RW, DesMeules M, Heng D, Lagace C, Guernsey JR, Kazanjian A, et al. Patterns of health services utilization in rural Canada. Chronic Dis Inj Can. 2011 Fall;31 Suppl 1:1-36.

(5) Braveman PA, Kumanyika S, Fielding J, LaVeist T, Borrell LN, Manderscheid R, et al. Health disparities and health equity: the issue is justice. Am J Public Health. 2011;101(S1):S149-55.

(6) Beiser M. The health of immigrants and refugees in Canada. CJPH. 2005:S30-44.

(7) Mawani FN. Social determinants of refugee mental health. Refuge and Resilience. In: Simich L., Andermann L. (eds) Refuge and Resilience. International Perspectives on Migration, vol 7 ed.: Springer; 2014. p. 27-50.

(8) Geronimus AT, James SA, Destin M, Graham LF, Hatzenbuehler ML, Murphy MC, et al. Jedi public health: Co-creating an identity-safe culture to promote health equity. SSM-population health. 2016;2:105-16.

(9) Lalonde M. A new perspective on the health of Canadians: a working document . Ottawa: Government of Canada; 1974 [cited accessed Dec 11, 2017].

(10) Epp J. Achieving health for all: A framework for health promotion. Health Promot Internation. 1987;1(4):419-28.

(11) World Health Organization. The Ottawa charter for health promotion: first international conference on health promotion, Ottawa, 21 November 1986. 1986 .

(12) Conference of Deputy Ministers of Health (Canada). Federal/Provincial/Territorial Advisory Committee on Population Health and Lord CT. Strategies for population health: Investing in the health of Canadians. Minister of Supply and Services Canada; 1994 .

(13) World Health Organization. Rio political declaration on social determinants of health [Internet]. Rio de Janeiro: WHO; 2011 [cited 2017 Jun 06]. Available from: http://www.who.int/sdhconference/declaration/en/.

(14) Rose GA. Rose's strategy of preventive medicine: the complete original text. : Oxford University Press, USA; 2008.

(15) Marmot M. Social justice, epidemiology and health inequalities. Eur J Epidemiol. 2017;32(7):537-46.

(16) Whitehead M. The concepts and principles of equity and health. Health Promot Internation. 1991;6(3):217-28.

(17) Braveman P, Egerter S, and Williams DR. The social determinants of health: coming of age. Annu Rev Public Health. 2011;32:381-98.

(18) World Health Organization. Health in all policies: Helsinki statement. Framework for country action. 2014.

(19) Graham H. Social determinants and their unequal distribution: clarifying policy understandings. Milbank Q. 2004;82(1):101-24.

(20) Dankwa-Mullan I, Rhee KB, Williams K, Sanchez I, Sy FS, Stinson Jr N, et al. The science of eliminating health disparities: summary and analysis of the NIH summit recommendations. Am J Public Health. 2010;100(S1):S12-8.

(21) Marmot M, Allen J, Bell R, Bloomer E, Goldblatt P. WHO European review of social determinants of health and the health divide. The Lancet. 2012;380(9845):15,16-21.

(22) Marmot M, Allen J, Bell R, Bloomer E, Goldblatt P. WHO European review of social determinants of health and the health divide. The Lancet. 2012;380(9846):1011-29.

(23) Anand S, Bärnighausen T. Human resources and health outcomes: cross-country econometric study. The Lancet. 2004;364(9445):1603-9.

(24) Venkatapuram S. Justice and global health research. American Journal of Bioethics. 2016;16(10):46-7.

(25) Office of the United Nations High Commissioner for Human Rights. The right to health, Fact Sheet No. 31 [Internet]. Geneva: World Health Organization; 2008 .

(26) United Nations Economic and Social Council. General comment No. 14: The right to the highest attainable standard of health (Art. 12 of the Covenant). UN Committee on Economic, Social and Cultural Rights (CESCR); 2000 .

(27) Wilkinson RG, Marmot M. Social determinants of health: the solid facts. : World Health Organization; 2003.

(28) Daelmans B, Black M, Lombardi J, Lucas J, Richter L, Silver K. Effective interventions and strategies for improving early child development. . British Medical Journal, BMJ. 2015;14(351).

(29) Duncan GJ, Magnuson K. Investing in preschool programs. Journal of Economic Perspectives. ;27(2):109,110-132.

(30) Barnett WS. Long-term effects of early childhood programs on cognitive and school outcomes. The Future of Children. 1995;5(3):25,26-50.

(31) Heckman J, Moon SH, Pinto R, Savelyev P, Yavitz A. Analyzing social experiments as implemented: A reexamination of the evidence from the HighScope Perry Preschool Program. Quant Econom. 2010;1(1):1-46.

(32) Heckman J, Moon SH, Pinto R, Savelyev P, Yavitz A. Analyzing social experiments as implemented: A reexamination of the evidence from the HighScope Perry Preschool Program. Quant Econom. 2010a; 1(1):1-46. Quantative Economics. 2010a;1(1):1,2-46.

(33) Peters RD, Bradshaw AJ, Petrunka K, Nelson G, Herry Y, Craig W, et al. The "Better Beginnings, Better Futures"ecological, community-based early childhood prevention project: Findings from Grade 3 to Grade 9. Monogr Soc Res Child Dev. 2010;75(3):1-176.

(34) Sanders M, Kirby J, Tellegen C, Day J. The Triple P-Positive Parenting Program: A systematic review and meta-analysis of a multilevel system of parenting support. Clinical Psychology Review. 2014;34:337,338-357.

(35) Muhajarine N, Ng J, Bowen A, Cushon J, Johnson S. Understanding the impact of the Canada Prenatal Nutrition Program: a quantitative evaluation. Canadian Journal of Public Health/Revue Canadienne de Sante'e Publique. 2012:S26-31.

(36) Browne AJ, Varcoe C, Ford-Gilboe M, Wathen CN. EQUIP Healthcare: An overview of a multi-component intervention to enhance equity-oriented care in primary health care settings. International journal for equity in health. 2015;14(1):152.

(37) Hoynes H, Miller D, Simon D. Income, the earned income tax credit, and infant health. American Economic Journal: Economic Policy. 2015;7(1):172-211.

(38) Milligan K, Stabile M. Do child tax benefits affect the well-being of children? Evidence from Canadian child benefit expansions. American Economic Journal: Economic Policy. 2011;3(3):175-205.

(39) Whiteford P and Adema W. What works best in reducing child poverty: a benefit or work strategy? OECD Publishing; 2007.

(40) UNICEF. Building the future: Children and the sustainable development goals in rich countries. 2017.

(41) Shankar J, Ip E, Khalema E, Couture J, Tan S, Zulla RT, et al. Education as a social determinant of health: Issues facing Indigenous and visible minority students in postsecondary education in western Canada. International journal of environmental research and public health. 2013;10(9):3908-29.

(42) Policy Horizons Canada. Unlocking the potential of marginalized youth.

(43) Colleges and Institutes Canada. [Internet]. Indigenous education protocol for colleges and institutes Available from: https://www.collegesinstitutes.ca/policyfocus/indigenous-learners/protocol/.

(44) Green D. The Case for increasing the minimum wage: What does the academic literature tell us? Vancouver, BC: Canadian Centre for Policy Alternatives; 2015 .

(45) Organization of Economic Development. [Internet]. oecd; Poverty rate [updated 2016 Available from: https://data.oecd.org/inequality/poverty-rate.htm.

(46) Dickens AP, Richards SH, Greaves CJ, Campbell JL. Interventions targeting social isolation in older people: a systematic review. BMC Public Health. 2011;11(1):647.

(47) Woodward A, Kawachi I. Why reduce health inequalities? J Epidemiol Community Health. 2000 Dec;54(12):923-9.

(48) Horton K, Friel S, de Leeuw E, McKeone C, Bolam B. Fair faoundations for health equity. Health Promotion International. 2015;30(S2):ii2-7.

(49) Lorenc T, Petticrew M, Welch V, Tugwell P. What types of interventions generate inequalities? Evidence from systematic reviews. J Epidemiol Community Health. 2013 Feb;67(2):190-3.

(50) Bambra C, Gibson M, Sowden A, Wright K, Whitehead M, Petticrew M. Tackling the wider social determinants of health and health inequalities: evidence from systematic reviews. J Epidemiol Community Health. 2010 Apr;64(4):284-91.

(51) Townsend J, Roderick P, Cooper J. Cigarette smoking by socioeconomic group, sex, and age: effects of price, income, and health publicity. BMJ. 1994 Oct 8;309(6959):923-7.

(52) Adler NE, Glymour MM, Fielding J. Addressing social determinants of health and health inequalities. JAMA. 2016;316(16):1641-2.

(53) Rose G. Sick individuals and sick populations. Int J Epidemiol. 1985;14:32,33-38.

(54) Mantoura P, Morrison V. Policy approaches to reducing health inequalities. 2016.

(55) Simpson S, Mahoney M, Harris E, Aldrich R, Stewart-Williams J. Equity-focused health impact assessment: a tool to assist policy makers in addressing health inequalities. Environ Impact Assess Rev. 2005;25(7):772-82.

(56) Graham L, Brown-Jeffy S, Aronson R, Stephens C. Critical race theory as theoretical framework and analysis tool for population health research. Critical Public Health. 2011;21(1):81-93.

(57) Hankivsky O, Grace D, Hunting G, Giesbrecht M, Fridkin A, Rudrum S, et al. An intersectionality-based policy analysis framework: critical reflections on a methodology for advancing equity. International journal for equity in health. 2014;13(1):119.

(58) Truth and Reconciliation Commission of Canada. Honouring the truth, reconciling for the future: Summary of the final report of the Truth and Reconciliation Commission of Canada. Truth and Reconciliation Commission of Canada; 2015 .

(59) Baum F, Lawless A, Delany T, Macdougall C, Williams C, Broderick D, et al. Evaluation of Health in All Policies: concept, theory and application. Health Promot Internation. 2014;29(suppl_1):i130-42.

(60) Cohen BE, Ateah CA, Chartier MJ, DeCoteau MA, Harris E, Serwonka K. Report of an equity-focused health impact assessment of a proposed universal parenting program in Manitoba. Can J Public Health. 2016;107(1):112-8.

(61) Delany T, Lawless A, Baum F, Popay J, Jones L, McDermott D, et al. Health in All Policies in South Australia: what has supported early implementation? Health Promot Internation. 2015;31(4):888-98.

(62) Bauman AE, King L, Nutbeam D. Rethinking the evaluation and measurement of health in all policies. Health Promot Internation. 2014;29(suppl_1):i143-51.

(63) Commission on Social Determinants of Health. Closing the gap in a generation: Health equity through action on the social determinants of health. Final report of the Commission on Social Determinants of Health.[Internet]. Geneva: World Health Organization; 2008 [cited 2017 Mar 31]. Available from: http://apps.who.int/iris/bitstream/10665/43943/1/9789241563703_eng.pdf.